



## Students' Perception towards Mathematics and Its Effects on Academic Performance

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### Authors' contributions

This work was carried out in collaboration among all authors. Authors JEH and EA designed the study, wrote the protocol and wrote the first draft of the manuscript. Author SA managed the analyses of the study. Author VTL managed the literature searches. All authors read and approved the final manuscript.

### Article Information

DOI: 10.9734/AJESS/2020/v8i130210

Editor(s):

(1) Dr. Vlasta Hus, University of Maribor, Slovenia.

Reviewers:

(1) Dimitris Chassapis, National and Kapodistrian University of Athens, Greece.

(2) Polyxeni Mitsi, University of Ioannina, Greece.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/57132>

Received 07 March 2020

Accepted 11 May 2020

Published 26 May 2020

Original Research Article

### ABSTRACT

**Aim:** The research sought to find out the perception of students towards Mathematics and how it affects their academic attainment in a Ghanaian context.

**Study Design:** Descriptive survey design was used for the study.

**Methodology:** The main instrument used for the study was questionnaire. The sample size for the study comprised of students selected from the three SHSs in Kumasi metropolis using purposive sampling approach. The sample size for the students consisted of 297 students selected by stratified sampling of which 180 were males and 117 were females.

**Results:** The students have positive perception towards mathematics though they see it to be difficult in a sense that it is important as it is used in their daily lives. The relationship between perception and students Mathematics performance in the study was very weak and negatively related.

**Conclusion:** From the study it can be concluded that students' perception towards mathematics has no influence or effect on their academic performance in Ghanaian senior high schools. It is recommended that students' positive perception towards Mathematics must be sustained and improved by teachers and headmasters.

*Keywords: Mathematics; perception; academic performance; teaching and learning.*

## 1. INTRODUCTION

Mathematics is perceived by society as the foundation for scientific and technological knowledge that is cherished by societies worldwide. It is believed to be an instrument for political, socioeconomic, scientific and technological developments [1]. Mathematics has importance over and above its perceived applications of basic numeracy skills. Over centuries ago, mathematics has been considered as the prime vehicle for developing student's logical thinking and higher-order cognitive skills. Additionally, Mathematics also plays a major role in a number of other scientific fields, such as Physics, Engineering and Statistics. Due to the relevance of mathematics and its application, it is widely regarded as one of the most important school subjects and a central aspect of the school curriculum in every society [2], as more Mathematics lessons are likely to be taught in schools and colleges throughout the world than any other subject [3]. In fact, the benefit that the study of Mathematics offers in the society is so profound that it is often used by Universities to filter secondary school learners for entry into the prestigious science-based degree programs [4, 5]. In spite of the benefits that the study of Mathematics offer, it is commonly accepted that Mathematics is difficult, obscure, and of little interest to certain people. It cannot be denied that Mathematics plays an important role in life but the reality is, majority of students find it very difficult to acquire the different mathematical skills and processes that are useful in their everyday lives.

On the international front, in Portugal, proficiency in languages, science, and Mathematics is seen as an essential precursor to success in modern society. Recent guidelines, set by the Ministry of Education regarding Mathematics and Portuguese Language curricula, tasks, evaluation, and workload, reflect this concern as these subjects are cross-curricular and are used in daily life. According to Ministry of Education of Maldives, only 28.4% of students who have participated in GCE O'level Cambridge examination in 2007 have passes above "C"

grade. Results of 2008, also showed similar trend where 66.8% of students getting grades below the expected level [6]. This suggests that Mathematics performances of Maldivian students have been very low throughout. Comparative international evaluations [7] revealed that Portuguese students did not perform as well as expected and that they under performed in Mathematics and languages when compared to students from other countries in the OECD. In Mathematics, results showed that whilst there was an improvement in Mathematics performance by Portuguese students from 2003 to 2009, in 2009, on a scale of six levels, Portugal still has in the region of 25% of their students at level 2 or below.

Additionally, several studies report that most African countries attach great importance to Mathematics than any other subject [8,9,10]. Despite the importance attached to Mathematics by Africans there has been low achievement in the subject in Ghana [11,12] and in other parts of the African continent as indicated by the Third Trends in Mathematics and Science study (TIMSS) of 2004 [13].

However, the complexity of factors that can influence Mathematics performance show that high achievement in Mathematics is a function of many interrelated variables related to students, families, and schools. Among student variables, Perceptions are regarded by several researchers, as an important/key factor to be taken into account when attempting to understand and explain variability in student performance in Mathematics [10,14,15]. According to [16] students' perception towards Mathematics teaching and learning play an important role in Mathematics education. The learning outcomes of students are strongly related to their perceptions towards Mathematics [17,18,19].

Some students view Mathematics as their Waterloo; as result, students perform poorly in Mathematics. These perceptions toward Mathematics and Mathematics learning and their implications for Mathematics instructions have long received much attention from both

Mathematics educators and mathematicians [20]. They further mention that in fact the poor performance of students globally in Mathematics is mostly linked to perception than any other variable. Students' poor achievement in Mathematics is not just a concern for particular countries, but has become a global concern over the years [7]. Cell-assembly-phase-sequence theory suggests that perception is a product of learning. Thus, one's acquaintance with anything new in the world helps to form perception. The theory states that initial reactions to a visual presentation (exposition) give rise to exploratory motor components that play a significant role of sequentially building up activities of small groups of brain cells into a larger sequence of activity during the process of learning [21]. Therefore, the process of learning involves interpreting information about anything discovered. What this highlights for our attention is that the opinion one forms about another person depends on the amount of information available to him/her and the extent to which he/she is able to correctly interpret the information the person has acquired. In other words, you may be in possession of the same set of information that other people have on a particular situation, person or group but still arrive at different conclusions due to individual differences in the capacity to interpret the information that you all have. However, this suggests that perception in this regard is ranks among the important cognitive factors of human behavior or psychological mechanism that enables people to understand their environment.

In particular, the relationship between perception toward Mathematics and achievement in Mathematics had traditionally been a major concern in Mathematics education research [22]. For example, [23] describes the relationship between the two as a consequence of a reciprocal influence, that is, perceptions affect performance and performance in turn affects perception. Additionally, a survey by [24] on the relationship between students' achievement in and attitude/perception towards secondary school Mathematics submitted that despite the different perspectives from which researchers have conceived attitude/perception, the common line of agreement was that the achievement of goals and objectives can be influenced or affected by attitude/perception and that a positive attitude/perception was more likely to engender achievement of a goal or objective (performance). On the other hand, there are studies reporting that the relationship between students perception and achievement in

mathematics is not statistically significant [25,26]. Additionally, a study in a recent decade suggests that, there is also research evidence showing no causal relationship between perception and performance [27]. Given this background, it is only reasonable and logic to assume that there is no consensus as to whether students' performance in Mathematics is influence by their perception or not. It is this background that has motivated the researchers to find out the perception of students towards Mathematics and how it affects their academic attainment in a Ghanaian context.

### 1.1 Research Questions

The study was therefore guided by the following questions;

1. What is the perception of students towards Mathematics?
2. What are the effects of student's perception on their Mathematics performance?

## 2. METHODOLOGY

The study adopted the Descriptive survey design to obtain data from participants in order to examine students' perception towards Mathematics and its effect on their academic performance. A survey research according to [28], is the one the researcher is interested in studying certain characteristics, attitudes, feelings, beliefs, motivations, behaviour, opinions of a population, which may be large or small, without attempting to manipulate any variables. The main instrument used for data collection of the study was questionnaire. The questionnaire used for the data collection were closed-ended. The questionnaire was made up five level Likert scale item of "strongly agree" to "strongly disagree". The items on the questionnaire were scored as follows: Strongly Agree (5), Agree (4), Uncertain (3), Disagree (2), and Strongly Disagree. The questionnaire consisted of two main sections with the first being the biographic section and the second section soliciting opinion of respondents on the perception of students towards Mathematics. Additionally, students' scores in their end of term exams was analyzed to deal with the perceived impact of perception on students' academic performance.

The population consisted of all Senior High Schools in the Kumasi metropolis in the Ashanti region of Ghana. Purposive sampling technique

was employed to select three schools for the study in such a way that each school represented a category of secondary school such as mixed school, boys' school and girls' school within the population. Only form two classes were used as the sample size for the study because they have gone through enough educational experience in Mathematics than that of the form one classes. The form three classes would have been used but were busy taking their WASSCE at the time the study was conducted. The sample size was drawn from Business class, Art class, Visual Art class and the Science class. Sample size was determined in each class to form the overall sample size for each school by using the proportionate stratified sampling technique. The sample size for the students consisted of 297 students (made up of SHS 2) selected by stratified sampling of which 180 were males and 117 were females.

### 3. RESULTS

This section presents the results of students' perception towards Mathematics and its effect on their academic performance in SHS in Ghana from students' perspectives. Specifically, research questions one was analysed by the use of means and standard deviations. Research question two was analyzed with the use of multiple regression analysis.

#### 3.1 The Perception of Students towards Mathematics

Research question one sought to determine the perception of students towards Mathematics. This research question is appropriately presented in Table 1 and discussed thereafter.

From the point of view of the students as shown in Table 1, the most common perception of

students towards mathematics in Ghanaian senior high schools are; I rate Mathematics equally high to all other core subjects (M=4.16, SD=0.88), Mathematics is important in our daily interactions (M=4.10, SD=1.04), Mathematics should continue to be a core subject (M=3.78, SD=1.45), Everybody needs mathematical knowledge (M= 3.59, SD= 1.35), I enjoy sharing mathematical solution strategies with my colleagues (M= 3.37, SD= 1.46), I will like to pursue further studies in Mathematics (M= 2.66, SD= 1.61), I enjoy studying Mathematics (M= 2.23, SD= 1.15), I have interest in studying Mathematics (M= 2.00, SD= 1.22), and the topics in Mathematics are easy to learn (M= 1.95, SD= 1.03).

#### 3.2 The Effects of Students' Perception on Their Mathematics Performance

Research question two also sought to determine the effects of students' perception on their Mathematics performance. Results obtained are presented in Table 2.

A linear regression analysis was conducted to evaluate the effect of students' perception on their Mathematics performance. Table 2 shows the results obtained. The regression analysis used the enter method to determine the effect of perception on students Mathematics performance. The predictor was perception and the criterion was students' Mathematics performance.

The result of the regression indicated that the strength of perception did not significantly explain the students performance,  $F(1, 281) = .206, p > 0.05$ . The sample multiple correlation coefficient was .027, indicating that approximately 0.1% of the variance of students' Mathematics

**Table 1. Perception of students towards mathematics**

	Mean	Std. deviation
I have interest in studying Mathematics	2.00	1.22
I enjoy studying Mathematics	2.23	1.15
I rate Mathematics equally high to all other core subjects	4.16	.88
Mathematics is important in our daily interactions	4.10	1.04
The topics in Mathematics are easy to learn	1.95	1.03
I enjoy sharing mathematical solution strategies with my colleagues	3.37	1.46
I will like to pursue further studies in Mathematics	2.66	1.61
Mathematics should continue to be a core subject	3.78	1.45
Everybody needs mathematical knowledge	3.59	1.35
Mean of Means/Average SD	3.09	1.24

Source: Field data

**Table 2. Effects of students' perception on mathematics performance**

Model		Df	Mean square	F	Sig.	Pearson correlation	R square
1	Regression	1	34.076	.206	.650	-.027	.001
	Residual	281	165.167				
	Total	282					

*P>0.05*

*Source: Field data*

performance in the sample can be accounted for by the students' perception. The relationship between perception and students Mathematics performance was very weak and negatively related ( $r = -0.027$ ).

#### 4. DISCUSSION

This result of the findings in Table 1 revealed that, the students rated Mathematics equally high to all other core subjects due to its importance. The revelation also shows students agreement that Mathematics was important in their daily interaction which indicated a positive perception. However, this finding agrees with the views of [5] which collectively opines that due to the importance of mathematics in our daily life and the development of our societies, mathematics is considered as a core subject for many countries across the world. In addition, findings from Table 1 indicated a positive perception towards Mathematics by stating that they enjoy sharing mathematical solution strategies with their colleagues. Due to the enjoyment students had in sharing mathematical solutions strategies, the findings also showed a positive perception towards Mathematics by indicating that Mathematics should continue to be a core subject. A positive perception is again seen as the findings also agreed that mathematical knowledge is for all. Therefore, it cannot be doubted that students have positive perception towards Mathematics due to their interest in the continuity of Mathematics being a core subject with the notion that everybody needs mathematical knowledge. Findings of this study prove the findings obtained by [14] who stated that, students had a positive perception towards Mathematics but the level of their positive perception was at the medium level.

Nevertheless, respondents also indicated a negative perception towards Mathematics. On Table 1 the findings showed a negative perception by indicating a low interest in the study of Mathematics. Moreover, the findings from Table 1 indicated that students had a

negative perception when they indicated that they do not want to pursue further studies in Mathematics. In addition, a negative perception towards Mathematics was identified when students failed to indicate enjoyment in the study of Mathematics due to the topics provided in the Mathematics syllabus. The findings revealed that the students are with the view that the topics in Mathematics were not as easy as it seems to be. Therefore, the topics in the Mathematics syllabus created a negative perception for the students towards Mathematics. Findings obtained confirms that of [24] who indicated that students had a negative perception towards Mathematics. They were of the view that most students perceived Mathematics to be difficult and concluded that the students understood that it was their responsibility to learn Mathematics and acknowledged Mathematics to be a subject which increases in difficulty as they progressed through the grades. Additionally, this is in line with the finding of [29] who stated that students had a moderate negative correlation between perception and Mathematics results thereby concluding that students had a negative perception towards Mathematics.

The results of the findings from Table 2 was to determine the effect of perception on students Mathematics performance. The result of the findings indicated that the strength of perception did not significantly affect the students' performance. It was found from the results that perception did not significantly predict students' academic performance in Mathematics ( $\beta = -0.027$ ,  $p < .650$ ). In summary, findings from the study indicated that perception did not significantly predict performance and therefore its inability to affect performance. However, this findings agrees with the revelations of [25] and [26] who opined in their research that the relationship between students perception and their performance in mathematics is not statistically significant to suggest a strong impact. There is also research evidence showing no causal relationship between perception and performance [27].

## 5. CONCLUSION AND RECOMMENDATIONS

From the study it can be concluded that students' perception towards mathematics has no influence or effect on their academic performance in Ghanaian senior high schools. However, the fact that students have indicated a positive perception towards Mathematics is an indication that if more concern is channeled towards students learning by classroom teachers, students will feel motivated to put in enough efforts in their learning. This suggests that a teacher with a sound knowledge in the Mathematics syllabus and good pedagogical knowledge will help to develop good perceptions towards Mathematics. It is expected that teachers should adopt varying methodologies in the teaching of Mathematics if students' perception towards Mathematics is to be improved and to pursue mathematics as they move along in the academic ladder. Therefore, it is important to remind students that Mathematics is for all and students must be motivated to understand that and put in much effort in the learning of Mathematics at any level.

It is recommended that students' positive perception towards Mathematics must be sustained and improved by teachers and headmasters. The interest of students should be heightened to ensure that they desire the study of Mathematics to improve their academic performance. Cooperative learning should be encouraged among students of Mathematics so as to enforce understanding of the concepts and topics in the Mathematics syllabus and also to develop the interest of learning Mathematics and erode negative perception.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

### REFERENCES

1. Githua BN, Mwangi JG. Students' mathematics self-concept and motivation to learn mathematics: relationship and gender differences among Kenya's secondary school students in Nairobi and Rift Valley Provinces. *International Journal of Educational development*. 2003;23:487-499.
2. Atteh E, Andam AE, Amoako J, Obeng-Denteh W, Wiafe F. The impact of using balance model in teaching linear equation. *Archives of Current Research International*. 2017a;11(3):1-12.
3. Orton A, Orton D, Frobisher LJ. *Insights into teaching Mathematics*. Continuum International Publishing Group; 2004.
4. Universities Joint Admissions. Board Proceedings of the meeting held – at UoN, Nairobi, Kenya; 2006.
5. Atteh E, Andam EA, Obeng-Denteh W, Okpoti CA, Amoako J. The Problem Solving Strategy of Solving Mathematical Problems: The Case Study of Esaase Bontefufuo Senior High Technical School, Amansie West District of Ghana. *International Journal of Applied Science and Mathematics*. 2014;1(2):40-45.
6. Ministry of Education Secondary school completion examinations; 2011. [Retrieved on 3 February 2015] Available: <http://www.moe.gov.mv/>
7. PISA. OECD programme for International Student Assessment (PISA); 2009. [Retrieved on 29 April 2015] Available:<http://www.pisa.oecd.org/>
8. Tahar NF, Ismail Z, Zamani ND, Adnan N. Students' Attitude Toward Mathematics: The Use of Factor Analysis in Determining the Criteria. *Procedia-Social and Behavioral Sciences*. 2010;8:476–481.
9. Tezer M, Karasel N. Attitudes of primary school 2nd and 3rd grade students towards Mathematics course. *Procedia Social and Behavioural Sciences*. 2010;2: 5808-5812.
10. Köğçe D, Yıldız C, Aydın M, Altındağ R. Examining Elementary School Students' Attitudes towards Mathematics in Terms of Some Variables, *Procedia Social and Behavioral Sciences*. 2009;1(1):291-295.
11. West African Examinations Council. West Africa Senior School Certificate Examination. Chief Examiner's Report. Accra: West Africa Examinations Council; 2012.
12. West African Examinations Council. West Africa Senior School Certificate Examination. Chief Examiner's Report. Accra: West Africa Examinations Council; 2013.
13. Gonzales P, Guzman JC, Jocelyn L. Highlights from Trends in International Mathematics and Science Study (TIMSS). National Centre for Education Statistic U.S. Department of Education. 2004;1-104.
14. Mohamed L, Waheed H. "Secondary students' attitude towards Mathematics in

- a selected school of Maldives. *International Journal of Humanities and Social Science*. 2011;1(15):277–281.
15. Mato M, De la Torre E. Evaluación de las actitudes hacia las matemáticas y el rendimiento académico,” *PNA*. 2010;5(1): 197–208.
  16. McLeod DB. Beliefs, attitudes, and emotions: New views of affect in Mathematics education. In D. B. McLeod & V. M. Adams (Eds.), *Affect and mathematical problem solving: A new perspective*. New York: Springer-Verlag. 1989;245-258.
  17. Furinghetti F, Pehkonen E. A comparative study of students’ beliefs concerning their autonomy of doing Mathematics. *Nordisk Matematikdidaktikk*. 2000;8(4):7-26.
  18. Leder GC, Pehkonen E, Törner G. *Beliefs: A hidden variable in Mathematics education?* Dordrecht: Kluwer Academic Publishers; 2002.
  19. Thompson AG. Teachers’ beliefs and conceptions: A synthesis of the research. In D. A. Grouws (Ed.), *Handbook of research on Mathematics teaching and learning*. New York: Macmillan. 1992;127-146.
  20. Royster DC, Harris MK, Schoeps N. Disposition of college Mathematics students. *International Journal of Mathematics Education in Science and Technology*. 1999;30(3):317-333.
  21. Bartley HS. *Principles of perception*, (2<sup>nd</sup> Ed.). New York: Harper and Raw Publishers; 1969.
  22. Ma X, Kishor N. Assessing the relationship between attitude toward Mathematics and achievement in Mathematics: A meta-analysis. *Journal for Research in Mathematics Education*. 1997;28(1):27-47.
  23. Neale DC. The role of attitudes in learning Mathematics. *Arithmetic Teacher*. 1969;16: 631-640.
  24. Ifamuyiwa AS. A study of the relationship between students’ achievement in and attitude towards secondary school Mathematics. *Olabisi Onabanjo University Journal of Educational Studies*. 2004;5(1): 35-42.
  25. Ng-Gan LC. Relationship between secondary school students’ Mathematics attitude and achievement. Unpublished master thesis, National University of Singapore; 1987.
  26. Papanastasiou C. School, teaching and family influence on student attitudes towards science: Based on TIMSS data Cyprus. *Studies in Educational Evaluation*. 2002;28:71-86.
  27. Maat SMB, Zakaria E. The learning environment, teacher's factor and students attitude towards Mathematics amongst engineering technology students. *International Journal of Academic Research*. 2010;2 (2):16-20.
  28. Aborisade F. *Research methods: A student handbook*. Lagos: Multifirm; 1997.
  29. Fasasi KM, Yahya AS. Teachers and students perception of the psychological factors influencing students’ achievement in Mathematics in secondary schools in Girei. Federal University of Technology, Yola; 2005.

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