



Students' Poor Mathematics Performance in Ghana: Are there Contributing Factors?

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJESS/2022/v30i430729

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/88964>

Original Research Article

Received 29 April 2022
Accepted 06 July 2022
Published 11 July 2022

ABSTRACT

Background: Evidence suggests mathematics is a field of learning that drives the global educational curriculum. Mathematics is viewed as interlinked to the technological and scientific knowledge pool. Mathematics is taught as a core subject in senior high school in Ghana to boast the students' abilities in solving problems. However, there is limited evidence on factors influencing poor mathematics performance by Ghanaian Senior High School students.

Aim: This paper investigates the factors which contribute to poor mathematics performance and attempts to give a feasible policy direction to improve performance and scale-up mathematic scare in the Senior Secondary Certificate Examination.

Method: A quantitative survey approach was used to conduct the study. Four hundred and Forty (440) senior high school students were sampled from form one to form three in Kumasi Metropolis. The sample size comprised 240 girls and 200 boys. Structured questionnaires were used for data collection. Descriptive statistics were used to estimate the results of the study.

Results: Findings from the study reveals that poor mathematics performance is attributed to three causes (i.) Lack of coverage of mathematics curriculum content, (ii). Lack of interest in mathematics, and (iii). the belief that they cannot understand mathematics.

Conclusion: We recommend the syllabus should be revised by integrating and focusing on topics that build the mathematical know-how to solve real-life problem/issue counters.

Keywords: Mathematics curriculum; poor mathematics performance; senior high school; belief; lack of interest.

1. INTRODUCTION

One of the most significant disciplines in the global school curriculum is mathematics [1]. It is the bedrock of scientific and technological knowledge that makes a substantial contribution to a country's socio-economic development [1-6]. Mathematics has an impact on many people's daily life [7]. Enu et al., [1] assert that mathematics is a discipline that has an impact on all facets of human life at various levels.

It is one of the most significant subjects in the educational curriculum, serving as a link between all disciplines (Kafata and Mbetwa, 2016). The International Mathematical Union (IMU) hypothesized that mathematics is the backbone and a tool for every country's scientific, technological, and economic development [8]. Educationists hold the view that without a basic understanding of mathematics, no one can advance in any subject [1, 9,10].

Mathematics remains the cornerstone of science and technology, and without it, a country cannot flourish and achieve economic independence. As a result, secondary school mathematics is one of the most significant core subjects. Amazigbo [11] found out that lack of interest on the part of the students contributes to poor mathematics performance while Samlesh et al. [12] revealed that an unsuccessful completion of mathematics curriculum in secondary schools is the cause of poor mathematics performance.

Despite the extensive recognition of mathematics as a useful subject that builds on our cognitive and intuitive abilities to address the problems of the reality, it is thus critical to highlight that low achievement and interest in mathematics among students in both developed and developing countries continue to be a source of concern to academics and policymakers [13,14] Sharmal et al., 2019; Sharmal et al., 2018). It threatens to impede most emerging countries' development. According to the report, "most African countries have inferior primary and secondary mathematics education, limiting the potential population of outstanding people who pursue mathematical degrees at the university level" [15].

Extensive evidence has been published regarding learners' mathematics performance in

a variety of contexts. Several factors have been identified as contributing to low performance in elementary and secondary schools around the world. Teacher-centered, learner-centered, school-centered, family-centered, and environmental factors, among others, all have an impact on mathematics teaching and learning quality and, as a result, poor performance. Learners' perceptions of mathematics as a difficult subject, as well as fear and anxiety, are learner-centered variables that contribute to poor mathematics performance in senior secondary schools [16]. "Students generally develop mathematical anxiety in schools as a result of studying from teachers concerned about their mathematical proficiency in certain areas," according to Hlalele [17]. Scholarships such as Makhubele & Luneta [18], and Khatoon& Mahmood [19] harmonized the proposition that poor mathematics performance is driven by students' unfavorable attitudes about the subject, which stem from social views that it is a challenging topic.

Today's school population according to Korau [20], is in the thousands, compared to the hundreds in previous years. Because of the overcrowding in today's classrooms, it's impossible to discuss the ideal classroom size for effective mathematics instruction. In a chaotic scenario, no effective teaching can take place since he or she is unable to successfully supervise many students. Quantity and quality cannot coexist knowingly, which may have an impact on students' mathematics learning and performance. The number of candidates for the West African Certificate Examination has increased [20]. From primary school to higher education in Nigeria, mathematics is given the attention it deserves in the curriculum and pedagogical practices. Mathematics is a basic or fundamental subject for all elementary and secondary school pupils, according to the Federal Republic of Nigeria (FGN). Furthermore, mathematics is one of the core subjects that students must pass to be admitted to any Nigerian postsecondary school.

Evidence from Ghana establishes the fact that the most contributing factor to perennial mass failure in basic/core mathematics is championed by the large class size [21]. According to Karikari et al. [22], students' study habits are the primary cause of their poor mathematics performance. It is further established that problem-based

learning was the most effective activity-based teaching strategy for improving mathematics education in the school. In addition, mathematics teachers' attitudes and teaching approaches have no statistically significant effect on students' academic performance [23]. In our quest to establish the root cause of poor mathematics performance among students, this paper seeks to answer the research question what are the factors that influence Ghanaians' Senior High School (SHS) students' poor performance in mathematics? An answer to this question may add to the body of evidence on teachers' views and instructional approaches that influence students' performances in Ghana.

2. METHODOLOGY

This descriptive study adopted a cross-sectional survey design with a stratified sampling technique. We used a researcher-based developed questionnaire to collect data from students at the Kumasi Metropolitan Assembly (KMA). The 18-item questionnaire was developed to collect data from students. The instrument measured items on whether students' poor performance in school mathematics is due to teacher absenteeism, incompetent teachers, lack of interest in mathematics on the part of students, poor primary school mathematical background, mathematics is difficult, lack of understanding of many topics that are not understood, lack of teaching facilities, lack of well-equipped library as well as other listed constructs.

To enable effective data collection, we divided Kumasi Metropolitan Assembly into three zones, namely North, South, and Central. We selected one school from each zone with a total of 440 students at random from three Senior High

Schools within the Kumasi Metropolitan Assembly for this study. We administered the questionnaires to the students at random with the help of their teachers. To ensure representativeness we sampled 150 students from each school with 50 students from each year group (Year 1, Year 2, and Year 3). To ensure equal access to participate in the study, we adopted the basic random method. The basic random method used for the sampling was a standard 'draw' method in which numbers 1 to 25 were written on slips of paper and other papers contained nothing. After that, the slips were placed in a container. They were drawn one by one after a thorough shuffle until the class's required number of students was met. This sampling technique was applied to each year group.

We computed descriptive statistics with frequencies and percentages for the demographic characteristics of students as well as major and minor factors associated with poor student performance. A response rate of 90 percent was achieved with 440 (240 females and 200 males) students returning the questionnaire. Results for this paper were estimated using Statistical Package for the Social Sciences (SPSS version 22).

3. RESULTS AND DISCUSSION

From Table 1, we found that majority of the respondents were female students (240) accounting for 54.5% of the total respondents, while male students (200) accounted for 45.5%. Many of the students at the SHS were between the ages of 15 and 20 with a total of 436 of them which represents 99.1%. Three students were within the range of 21 to 26 year which represent 0.7% and only a student was above the age of 26 years which represents 0.2%.

Table 1. The demographic background of the sampled students

	Variable Category	N	(%)
Gender	Male	200	45.5
	Female	240	54.5
Age	15 to 20	436	99.1
	21 to 26	3	0.7
	26 and above	1	0.2

% refers to the percentage; N refers to the number of respondents; Source: Primary source

Table 2. Show factors that influence students' poor performance in mathematics

Factors	Very True N (%)	True N (%)	Fairly True N (%)	Not True N (%)
Incompetent mathematics teachers	58(13.2)	41(9.3)	79(18.0)	262(59.5)
Teachers' absenteeism	61(13.9)	65(14.8)	87(19.8)	227(51.5)
Most students do not have an interest in mathematics	228(54.1)	97(22.0)	62(14.1)	43(9.8)
Poor primary background in mathematics	190(43.1)	105(23.9)	76(17.3)	69(15.7)
Mathematics is difficult for me	58(13.2)	41(9.3)	79(18.0)	262(59.5)
Many mathematics topics are not understood	146(33.1)	98(22.3)	98(22.3)	98(22.3)
Lack of teaching facilities	157(35.7)	78(17.7)	69(15.7)	136(30.9)
The library is not well equipped	191(43.4)	62(14.1)	61(13.9)	126(28.6)
Expensive mathematics textbooks	136(37.7)	79(18.0)	83(18.9)	112(25.5)
Lack of time for practice	198(45.0)	90(20.5)	75(17.0)	77(17.5)
Overcrowded mathematics classroom	110(25.0)	78(17.7)	70(15.9)	182(41.4)
Mathematics curriculum content not fully covered	281(63.9)	76(17.3)	53(12.0)	30(6.8)
Exhibition of poor knowledge of mathematics content by many mathematics teachers	92(20.9)	71(16.1)	96(21.8)	181(41.2)
The method of teaching and availability of course material	135(30.7)	113(25.7)	101(23.0)	91(20.6)
The behavior of some mathematics teachers	190(43.2)	76(17.3)	65(14.8)	109(24.8)
Some students believe they cannot understand mathematics	283(64.3)	71(16.2)	41(9.3)	45(10.2)

% refers to the percentage, N refers to the number of respondents; Source: Primary source

4. DISCUSSION

To the best of our knowledge, this is a premier study done among students in Kumasi Metropolis in Ghana. The findings revealed that a lack of coverage of mathematics curriculum content, lack of interest in mathematics, and belief that they cannot understand mathematics are the major factors that contribute to poor mathematics performance in Ghana. Students were asked to tick which of the factors contribute to their poor performance in mathematics. Many of the students believed that teachers' absenteeism and incompetent mathematics teacher are not the reason for their poor performance in mathematics which agrees with the findings of Yarkwa, [23] that mathematics teacher attitudes have no relationship with students' academic performance. 59.5% said is not true that incompetent mathematics teacher is responsible for their poor performance in mathematics. 18% of respondents said fairly true that incompetent mathematics teacher is responsible for their poor performance in mathematics. 13.2% of students said it is very true and 9.3% said it is true that incompetent mathematics teachers influence

their academic performance in mathematics. Moreover, 51.5% of the students said it is not true that teachers' absenteeism is responsible for their poor performance in mathematics.

Furthermore, 281 students (63.9%) agreed that it is very true and 76 students (17.3%) agreed that it is true that mathematics curriculum content is not fully covered, affecting their academic performance, confirming Samlesh et al. [12] that an unsuccessful mathematics curriculum in secondary schools is the cause of poor mathematics performance. Also, 228 students said they do not have an interest in mathematics because they believe mathematics is difficult for them which agrees with Amazigbo,[24] that lack of interest on the part of the students contributes to poor mathematics performance.

According to the findings of this study, students have no interest in learning mathematics. They believe mathematics is a difficult subject, which is a belief that they often inherit from their parents and society. Our study revealed that overcrowded was not the cause of students' poor mathematics performance which contradict the

finding of Korau, [20] that overcrowded is the cause of students' poor mathematics performance. In addition to 283 students which represent 64.3% believe that they cannot understand mathematics which confirms the findings of Asikhia, [16] that some students have the perception that mathematics is difficult for them to understand.

4. CONCLUSION

The findings supported the research question, which investigated the factors that contribute to poor mathematics performance in Ghana's Kumasi Metropolis. The factors that influence mathematics achievement have been identified as being related to the qualities of students, teachers, schools, and society. The findings should be useful to teachers and others interested in enhancing mathematics teaching and learning and, as a result, boosting student performance in the subject. The Ghana Education Service, Ghana, is responsible for providing innovative solutions that are appropriate to the identified difficulties. The researchers found that the mathematics syllabus is loaded, and they urge that the Ghana Education Services reconsider the syllabus to make it more workable.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

ACKNOWLEDGEMENTS

I would like to thank Matthew BOADIE-AMPONG and Kofi Adjei for their comments and suggestions.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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