Beyond the numbers: Investigating the root causes of poor performance in core mathematics among senior high school students in the eastern corridor of the Northern Region, Ghana

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ABSTRACT

The study examines the causes of low performance in core mathematics among students in Senior High Schools, along the Eastern Corridor Northern Region of Ghana. The study was guided by Bronfenbrenner's theory of ecological systems, and adopted a descriptive survey with a quantitative approach. Data was analysed by the use of SPSS version 25.7. Sample size of 788 was drawn from a target population 2475 students. Students' questionnaires were used to collect the data for the study. Means and standard deviation were use to analyse the data while multiple linear regression and correlation test was used to determine the relationship between student behavior and performance of core mathematics. The results showed that performance in core mathematics was found to have a positive correlation with teacher-related issues. The study recommended promoting positive student behaviors and addressing negative habits are essential strategies for improving learners' outcomes in core mathematics. Also, teachers should avoid negative behaviors like poor communication and favoritism to prevent students' anxiety and disinterest in core mathematics.

Keywords: Academic Performance, Attitude, Absenteeism, Punctuality, Student Related Factors, Teacher Related Factors

I. INTRODUCTION

Advancement in any nation can be attained through mathematics. One of the measures is through training a population with the ability and knowledge to use mathematics. Economic advancement results in innovative social progress and a trained workforce. Analytical skills and problem solving of a workforce add to the knowledge gained, and enable to tackle issues in the sector of health care, and in the industries of production, construction, food, and other of major importance (Maass et al, 2019). According to Steegh et al. (2019), in the global market outlook, any nation that champions mathematics training, and its evaluation research, gets the upper hand of the world economy. Verbruggen et al. (2021), stated that the world gets maximum benefits of mathematics overly owing to high usage of technology. Due to technology, there is a higher demand for skills in mathematics.

In the 21st century, the value of mathematics, especially in the realm of basic/secondary education, in relation to the world of work and the global economy is uncontested. Mathematics education enables learners to gain the necessary skills, knowledge and attitudes needed for career progression (Asamoah et al., 2020). For two decades, Ghana has been revising its mathematics education but there continues to be issues and difficulties pertaining to the models of teaching that need addressing (Kumah et. al. 2023). The importance of mathematics for development of nations cannot be emphasized, particularly in initiatives to achieve the desired goals in the STEM (Science, Technology, Engineering, and Mathematics) areas, as they are direct result of the overall social, political, and economic transformation of the country, (Sharma, 2018a). Mathematics is a compulsory subject in Ghana's National Education Policy and compulsory to study up to the pre-tertiary level due to its importance, for the study of science and technology. Poor mathematical skills, however, are major hindrance to the opportunity to participate in higher education, and consequently the employment sector (Poku, 2019).

Kumah et al. (2023) contended, that in order for Ghana to produce scientists, technologists, and engineers, mathematics has to remain compulsory in primary and secondary education. They proposed a change in focus due to how mathematics is dealt with in universities and how that impacts things. So therefore, the need for education stakeholders to direct their focus to how mathematics is taught at secondary school in order to prepare students for the science and technology streams at university. Contrarily, Bosson-Amedenu (2018) spoke concerning phenomenon of poor mathematics instruction in Ghana. A plethora of issues have been attributed to inadequate teaching and learning.

The trend of blaming teachers for students' poor performance at secondary school has been noted in other works (Karikari et al, 2020; Fokuo et al, 2022).

Despite importance placed on the subject, there remain consistent trend of poor performances on both internal and external assessments (Sa'ad et al., 2014; Asamoah et al., 2020). However, there appears to be limited descriptive documented studies to analyze the possible reasons. Thus, the primary focus of this work is to contextualize the etiology of poor performance in the study of core mathematics in the Eastern Corridor of the Northern Region of Ghana's Senior High Schools. This specifically considers the elements of the behavior of students and certain teacher-related variables in the focus of the study to analyze the performance in core mathematics. The central objective of the study is to determine the Root Causes of Poor Performance in Core Mathematics among Senior High School Students in the Eastern Corridor of the Northern Region.

1.1 Research Objectives

i. To examine the influence of students' behavior on their performance in core mathematics,
ii. To access the influence of teacher-related issues on students' performance in core mathematics.

II. LITERATURE REVIEW

2.1 Theoretical Review

This study is informed by the work of Bronfenbrenner, sociologist who developed the Ecological Systems Theory in 1989 and 1995. Is of necessity to note that the theory is concerned with provision, description, and analysis of civil life and human development with respect to the various relational dimensions that exert a push or pull against the human's academic and ambient environments.

2.1.1 The Explanation of Bronfenbrenner's Ecological Systems

In 1989, Bronfenbrenner's System Theory first proposed that individual's surrounding world is composed of four layers, including microsystem, mesosystem, ecosystem, and macrosystem (Bronfenbrenner, 1989). The systems in the theory interrelate in different ways and can significantly influence individual's overall development. The chronosystem, which incorporates time, is possibly the last of the systems to be introduced.

Bronfenbrenner's Ecological Systems Theory outlines human development within multiple intertwined systems. The first of these systems, the microsystem, refers to the environments where an individual has direct contact and engagement, which include family, school, teachers and peers, and personal characteristics, and where there is bi-directional influence between the individual and the environment. The mesosystem is about the interactions of these microsystems; for example, the relationships between teachers and students, or between school and home, which influence the school system. The exosystem is made of external systems, such as educational system, employment, and legislation, which affect people even though they do not have the power to influence these structures. The macrosystem contains the overarching cultural, social, political, and economic characteristics that shape all systems including school and community systems. The chronosystem captures the influence of time, which encompasses life changes or transitions, shifts in history, and the changes in schools over time, and these factors influence both individual and systemic outcomes.

Bronfenbrenner (1995) noted that a child is a member of numerous social systems, but not limited to family, school, and neighborhood, all of which impact the child's development. These include the relationships of parents, children, siblings, friends, and teachers and the educational social network, and other social relations. The theory emphasizes the social, political, cultural systems and institutions and the values of the society that surrounds the learner.

Social relationships within the systems, which include 'spheres' and 'sub-spheres' of social and biological systems, are critical to a child's academic achievement, explains Bronfenbrenner. Thus, the social system perspective of education accounts for the deficit in the mastery of Core Mathematics in the Eastern Corridor Region of the Northern Region. The theory accounts for the multiple social and infrastructural factors surrounding a student's education to explain the underachievement of the learners in the region.

This study relies on the components of Bronfenbrenner's framework of ecological systems theory (1989, 1995) to argue that the student-related factors, pedagogy, and other teacher-related factors are what explain the core mathematics achievement of pupils. Consequently, the poor performance of students in Eastern Corridor High Schools is likely the result of the interconnection of teachers, students, schools, and parents.

2.2 Empirical Review

In 2020, Asamoah et al. looked into what Senior High School students in Ghana's Kumasi Metropolis thought were the reasons why they were doing poorly in core mathematics. There were a descriptive survey design and a quantitative technique used in the study. Multiple stages of sampling were used to choose 431 individuals as a sample. What the study found was that low performance in core mathematics was caused by things in the school environment,

the teachers, and the students, such as not having enough teaching and learning resources (TLRs), being late or absent, teachers not being able to finish their lessons, and students not liking core mathematics classes or having a bad attitude towards it.

In 2014, Sa'ad et al. looked into why government owned Senior Secondary School students in Azare Metropolis, Bauchi state, Nigeria, did poorly in mathematics. Data were gathered using a descriptive survey methodology and a questionnaire. The study found that some of the reasons students do not do well in mathematics are a negative attitude toward the subject, anxiety and fear of it, not having qualified teaching staff, bad teaching methodologies, not having enough teaching materials, and groups that are too crowded. The study also found that some ways to improve math performance in the study area were to have a positive attitude towards math, be motivated to learn it, get the right help, use the right teaching methods, and provide relevant TLRs, more classrooms with furniture, libraries, and math labs

Jameel and Ali (2016) looked into why some students don't do well in mathematics by talking to teachers, parents, and students themselves. A descriptive research approach and a simple random sampling method was used for the study. An organized questionnaire is a way to get information. Also, Statistical Package for the Social Sciences (SPSS) was used to do the data analysis and explanation. According to the students, not getting enough exercise was the main reason they didn't do well in mathematics, while the teachers thought it was because of how strict they were when teaching mathematics. Also, parents' views on lack of attention as a major cause of poor mathematics success showed that this was the case.

Asunafo South District in Ghana, Poku (2019) looked at the relationship between how students felt about mathematics and how well they did in mathematics as part of a study that looked at how junior high school students' feelings about mathematics affected their academic performances. The study looked at whether there is a link between how high school kids feel about mathematics and how well they learn it. Finally, it looked at differences between genders and how they affected how well students did in mathematics. The mixed method approach called triangulation was used for the work. We used descriptive and inferential statistics to look at the quantitative data from semi-structured questionnaires and test results, and thematic statistics to look at the qualitative data from the interviews. Students in the chosen schools have a positive attitude towards learning math, as shown by the study's results, which also showed a higher positive correlation between attitude and math success in their fields of study. The research also showed that the students' surroundings, specifically the way math teachers and other teachers treat them, has a bigger effect on their mathematics scores. The results once more showed that there is no difference between boys and girls when it comes to mathematics. Both boys and girls did the same in mathematics.

2.2.1 Student-Related Factors

Various factors related to students in the academic context have been demonstrated to affect students' academic performance positively or negatively, including students' passion for the subject, fluency in English, health and nutrition, motivation, self-esteem, and classroom behavior (Adane, 2013; Segkulu, 2022; Yaro & Kipo-Sunyehzi, 2024). Engin-Demir (2009), examined 719 elementary students from underprivileged backgrounds in urban schools, and suggested that students, regardless of their ability, who did spend some time doing the homework, obtained better grades than those who did not spend time doing the homework. This illustrates that doing homework enhances the drive to complete assignments (homework). Likewise, in their study of 7,000 Tunisian students, Sa'ad et al. (2014) stated that homework enhances learning only if it is assigned, graded, and practiced in mathematics and science (Asamoah et al., 2020; Yaro & Kipo-Sunyehzi, 2024).

As noted by Allen-Meares et al. (2000), truancy, lateness and unauthorized absence all impact negatively on one's school performance. Fokuo et al (2022) surveyed 685 tenth grade learners in Pakistan, and were able to conclude that learners' attitude towards the subject of Mathematics was a significant determinant of their performance. The study recorded lateness, absence and indiscipline as factors that contributed to underachievement. Similarly, Kumah et al (2023) surveyed 1780 secondary school learners in Ghana, and corroborated that one's self perception is a strong determinant of one's academic achievement. Those who have positive self-conception displayed greater enthusiasm as well as interest towards learning.

Sharma et al. (2018a) in Ghana examined the problem of underachievement among primary school children in the Shama Sub Metro of the Shama Ahanta East Metropolitan Assembly and found that academic achievement improves with more study and homework assistance. Students improved their performance when they understood that the teachers made the lessons more interesting to them, because of the adequate instructional materials and the teachers' dedication.

It is in the emerged issues that we see when such factors are absent motivation, attendance, and discipline, along with appropriate teaching and teaching assistance, that the performance is destined to remain low. This is a gap that this study intends to fill in order to understand how student-related factors are the primary cause of the persistent poor performance in core mathematics of Senior High School students along the Eastern Corridor of the Northern Region.

2.2.2 Teacher-Related Factors

There are some teacher-related factors which influence the academic performance of learners; these factors are: mastery of content, lesson preparation, lesson planning, linguistic choices, instructional methods utilized, work ethic, compassion, motivation, and class attendance (Mwenda et al., 2013). In a study conducted by Mwenda et al (2013) involving 248 respondents from secondary schools in Tharaka South District, Kenya, it was found that the punctuality and attendance of teachers together with their active engagement in the performance of their teaching duties had a positive influence on the academic performance of learners in Mathematics.

In a similar perspective, Adane (2013) examined the factors attributing to the poor academic performance of learners in Kemp Methodist Junior High School, Aburi in Ghana involving a sample of 120 learners, 31 teachers, and 120 parents. The results of the study revealed that the extent of teacher lateness that ranged from 5 minutes to 1 and 1/2 hours was a demotivating factor to the academic performance of the learners. Adane (2013) as well as Anane (2015) noted that the learners show a declining trend in the level of understanding as the teaching continues because the syllabus is not completed.

Moreover, in the case of the mastery of mathematics, the results obtained may depend on how the instructional staff possess and teach the subject knowledge (Segkulu, 2022); Asamoah et al., 2020). While it is recognized that the qualifications which a teacher possesses is not what is to be aimed at, a teacher not having the knowledge and skills in the content area, as sited in Adane (2013) Agyeman, does not provide a conducive situation for the teaching and learning to take place. Thus, as stated by Adane (2013), the knowledge of the content, the presence of textbooks, the appropriate allocation of time for instruction, and the adequate supply of instructional materials are the primary aspects which influence the levels of achievement of the learners.

III. METHODOLOGY

3.1 Geographical Scope

This study examined four jurisdictions located in the Eastern Corridor of the northern region of Ghana: the Nanumba North Municipal, Nanumba South District, Kpandai District, and the Yendi Municipal. This region has educational and healthcare infrastructure and various other services, such as water, electricity, ICT, transport, and tourism. The educational infrastructure in the region consists in part of E.P. College of Education (Bimbilla), St. Vincent College of Education (Yendi), and Yendi Health Assistant Training College (Yendi). There are also Kpandai Senior High School (SHS), Bimbilla SHS, Wulensi SHS, Yendi SHS, Dagbon State SHS, Almatum SHS (private) that is five public and one private second-cycle institutions, as well as other educational institutions of tertiary, secondary, and basic levels.

3.2 Research Design

According Creswell and Creswell (2020), research design is the blueprint for completing a research project. The focus of the study was on a descriptive survey research design with the use of interviews and questionnaires for data collection (Steegh et al, 2019). The collected responses were analyzed quantitatively. According to Asamoah (2020), in regard to clarifying and providing information for various factors, descriptive designs are said to be efficient. To accurately capture the essence of the study, Attard and Holmes (2022) also stated a descriptive survey in order to provide a detailed outline of the variables in question.

3.3 Research Approach

The approach is quantitative, in the sense of Creswell and Creswell (2020) and is also guided by positivist paradigm assumptions. There is an emphasis on objectivity, measurement, and quality control. According to Leavy (2023) quantitative research is about the evaluation of the relationship of variables within a framework and involves hypothesis testing in a deductive manner. It was intended to get numerical descriptions of the observations that could be generalized or extrapolated to the Senior High School students within that particular locality as well as the entire nation of Ghana.

3.4 Study Population

A population in research is understood as all persons who meet given criteria (Leavy, 2023). This study targeted all SHS 2 learners in Bimbilla, Wulensi, and Yendi SHSs, which came to 2,475 students in the Eastern Corridor of the Northern Region.

3.5 Sample Size Determination

A sample is a segment of the broader population that is selected to analyze in order to make inferences about the totality. In quantitative studies, the larger the sample, the more the representativeness (Creswell & Creswell, 2020). Sample size has huge implications to the estimate that is obtained in relation to the whole population. Thus, the current

study opted for the approach of Miller and Brewer (2003) to determine sample size based on probability sampling methods.

$$n = \frac{N}{1+N(\alpha)^2}$$

Where n = required sample size, 1= constant, N = Population, α = level of significanceor marginof error. In order to have a fair representative sample size, the sample size is determined at a 95% confidence level (at a = 0.05 significance level). For Bimbilla SHS the sample size of SHS2 with a population of 924, the calculation is as follow;

$$n = \frac{924}{1+924(0.05)^2}$$

$$n = 279$$

The same procedure is used to calculate the sample size for the remaining categories of the study population as shown in Table 1 below. Hence the study sample size is 788.

Table 1

Sample Size Determination

Schools	**Population**	**Sample**
Bimbilla SHS	924	279
Wulensi SHS	460	214
Yendi SHS	1091	295
Grand Total	**2475**	**788**

3.6 Sample Techniques

Sampling methodology is concerned with the method used to derive participants from the sample population for a study. Furthermore, Leavy (2023) assert that sampling is the act of choosing one subject or a group of subjects from a bigger population for the purpose of a study, with the expectation that they will be able to provide the relevant and needed information for the study. The study utilized a sample of students which was a result of the application of convenience sampling and simple random sampling techniques. Convenience sampling was employed due to the fact that the students were busy with their coursework during the study period and thus, were unable to provide feedback to the questionnaires. The researcher depended on the students' willingness and their accessibility during the breaks from their classes. The simple random strategy is employed in the selection of students when there is a large number of people who are willing to respond to the questionnaires.

However, the process of selecting the subjects to be interviewed is faced with challenges and difficulties that are peculiar to the situation. The ease with which one is able to assess subjects using non-probability sampling methods comes with a number of risks, including bias on the part of the researcher. No sampling rules were followed when selecting the participants to be interviewed in this case study. In large populations, simple random sampling is used to make reliable estimates.

3.7 Instruments for Data Collection

The selection of appropriate data collection instruments is of utmost importance, as the data collection instruments must be purposeful and capture the required data for the study. In this study, a quantitative approach was also adopted, requiring the use of a structured questionnaire for data collection. The questionnaire comprised closed-ended questions, enabling participants to choose from a range of alternatives that best represented their views.

Questionnaires, as noted by Barakabitze et al. (2019) are a useful method of collecting information at a lower cost and less time. To facilitate feedback concerning the study variables, the questionnaire contained Yes/No questions as well as a five-point Likert scale. This method is advantageous as it is more cost effective and is easier to analyze than interviews or focus group discussions. Primary data is responsive and can be easily coded and analyzed which is why questionnaires are a popular method of data collection.

3.8 Data Collection Procedure

To collect data for the study, the researcher drafted an introductory letter and sent it to the administration of Bimbilla SHS, Wulensi SHS, and Yendi SHS to request the necessary permissions to conduct the study. Once the permission was granted, the researcher made sure to the participants to which the questionnaires were later on sent to, that their data would be protected. The participants were asked to select students, who they thought would be appropriate to help, and then the collected responses were analyzed. This process, which was carried out more than once, continued until the desired data was finalized.

3.9 Pretest and Quality Control of Instrument

As a result of the homogenous population within Kpandai Senior High School, a pre-test was conducted. Field assistants were trained, and a pilot survey of ten respondents was conducted in order to evaluate the word, order, and logic of the questions. The pre-test showed bad question design as the respondents did not appear to be engaged. Afterward, the completed questionnaires were examined for errors as well as for the lack of responses, ambiguous responses, and the unusable questionnaires were eliminated. Data was entered doubly to preserve precision and to avoid validation errors.

3.10 Source of Data

This research derives its information from two main sources: primary and secondary sources. Primary sources in this instance involve the filling of surveys and handing in receipts from a subsection of the class participants from the targeted strata. The primary data targeted in this study, constitute the most recent and real time data, while those who volunteered are respondents of targeted questionnaires. The most recent phenomenon that the data holds value for is those which the researcher proposes, owing to the fact that they possess unique perspectives. In this regard, secondary data includes information collected from documents which may be published or unpublished, such as magazines, books, and journals obtained from a local or international library. The websites, which also constitute a secondary data source, were used in establishing the initial justification and theoretical foundation for the study.

3.11 Reliability and Validity of Study

The validity and reliability of a certain study that being discussed rests on how the results of the study measure and the correlations the results possess with the measuring instrument and the results of the measure themselves (Creswell & Creswell, 2020). When a test and or assessment is considered valid, it renders a valid sphere of evaluative conclusions that are drawn and the results or score figures that the test possesses, the theoretical premise is that any right action is taken on the inferences and what actions are taken. Defining the trust and credibility of sampling results seems impossible. The “judge” strategy rests on a superior tier of the systems. It is given that the decision maker is familiar with the population in question and able to execute expert level reasoning, the sample may be representative, otherwise, the conclusions that will be drawn will be biased if the decision is made otherwise. It is important to state that in case of a judgement sample which is surely representative, there is no objective way to say what is the level or what is the degree to which the sampling error might be in that sample. This is a big disadvantage in the approach.

3.12 Data Analysis

Barakabitze et al (2019) defined the concept of analysis as the disaggregation of information, as well as the explanation of the underlying properties of the parts and how they interrelate. Within the context of this study, the quantitative approach to analysis was adopted. The examined data utilized both descriptive and inferential statistics. The statistical analysis was aided by the use of SPSS and Microsoft Excel. The background section of the questionnaires was analyzed as a function of frequency (N) and percentage (%) and presented in tabular form. The analysis of the research questions involved the use of percentages (%), frequencies (N), means (M), and standard deviations (SD). Factor analysis was used to establish the factor loadings and correlations among the several factors derived from the questionnaires. To establish the effect of each of the factors, as well as which of the independent variable influence the dependent variable the most, multiple linear regression analysis and ordinary least squares regression analysis were conducted.

3.13 Informatics and Representation of Information

The validation and clarification of each response within the dataset involved the organization, editing, and coding of the datasets. The responses from the questionnaires were analyzed in a descriptive manner, which resulted in tabulated outcomes conveying the information in terms of frequency distributions and percentages. The editing process gave the researcher the opportunity to recover from omissions (if any) within the resultant dataset and ensure that the dataset was precise, consistent, and complete.

IV. FINDINGS & DISCUSSION

4.1 Findings

4.1.1 Personal information of the Respondents

This section contains the personal information of the study participants. This section serves as the foundation of the analysis, wherein the bioinformation of the respondents is explicitly delineated. *Sex of Respondents:* Gender representation is crucial for the development of talent, particularly in mathematics. This study considered the significant aspect of mathematics and female representation, posing enquiries on the presence of females and males in our

classrooms. The research indicated that 51.7% (percent) of respondents were male, whereas 48.3% (percent) were female, as illustrated in figure 1 below.

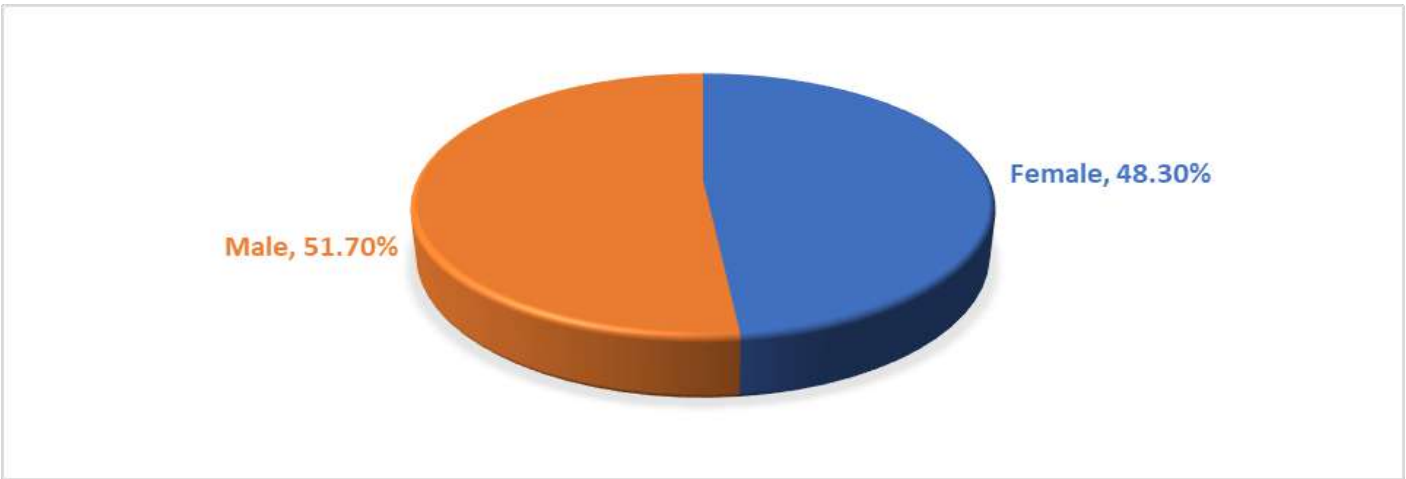

Figure 1
Participants Sex

Age of Participants: An examination of the age range of participants indicated that over half (52.2%) of the responses were aged 16 to 20 years. Furthermore, it was shown that 37.5% (percent) of the respondents were aged 21 years or older, while only 10.3% (percent) were between the ages of 13 and 15, as indicated in Table 2.

Table 2
Age of Respondents

Age	Frequency	Percent (%)
13-15	81	10.3
16-20	411	52.2
21+	296	37.5
Total	**788**	**100**

4.1.2 Students' Behaviors that affect their Performance in Core Mathematics

This investigation focuses on the effects of students' behavior on the students' grade scores in the core mathematics unit. From the survey response data, the mean score of 2.16 implicates that nearly 2 respondents of the 4 respondents agreed that students' absences in core mathematics classes is a menace in the sampled schools. The investigation produced a mean score of 4.32, which is close to 4 that indicates the respondents' agreement to the statement that students' absences in essential mathematics classes is a menace in the sampled school. A mean score of 1.52, which is close to 2, indicates that the respondents agreed that the students in the lesson spent occupationally wasting time on task, which centered on low-level activities that constrained the students' understanding of the particular lesson. The mean score of 2.26, which is close to 2, indicates encouragement from the respondents that the sampled schools inadequately and inefficiently employed available school facilities, like the school library and the mathematics laboratory, which because of these poor facilities resulted in the students' poor understanding of the subject matter.

A mean score of 1.59, which is close to 2, demonstrates that the participants in the study agreed that absences in core mathematics classes are a significant issue in the selected institution. From the survey, a mean of 2.37, of a little over 2, indicates that respondents affirmed students' negative and obstinate attitudes toward mathematics as a whole and that such attitudes contributed to a decline in performance in the subject.

Another study showed a score of 1.48, which indicates that respondents agree that students who attend a mathematics class are disengaged and as a result, do not perform well. Respondents showed a 2.31 consecutively agreed that students perceive basic mathematics as quite abstract. The study demonstrated a mean of 3.41, which is close to 3, indicates that respondents were uncertain if students really do hide behind overcrowded classes as a reason to not do mathematics.

The collected data revealed that the average score of 2.38 approximating the score of 2, indicates that a majority of the respondents concur that pupils do not engage in basic mathematics assignments and related classroom activities at the given institutions. A different study resulted in a score of 1.34, closer to 1, signifying that respondents were in agreement that students' anxiety and irrational fears of mathematics is a significant contributing factor towards their

underachievement. The respondents' average score of 2.06, closer to 2, suggest that respondents agree that children fundamentally lack self-confidence in mathematics during their school years. The next item is the statement "peer group influence does not enhance the learning of core mathematics in my school" that has the highest score of 2.17, or in the vicinity of 2, indicates that the respondents agree that peer group influence does not support the learning of core mathematics in their school.

In addition, the study found a mean score of 2.53, somewhat closer to 3, implying that the respondents were apathetic to the extent of dissatisfaction that students displayed while learning fundamental mathematics in their school. The mean score of 1.06, somewhat closer to 1, indicates that the respondents were in strong agreement that students do indeed spend a trivial amount of time learning fundamental mathematics in their school. The study also found an almost indifferent mean score of 3.42, somewhat closer to 3, which indicates the respondents' apathy to the lack of self-esteem students possess when studying core mathematics in their school. It also found a mean score of 2.28, somewhat closer to 2, which indicates that the respondents were in agreement that students possess a negative disposition toward the learning and teaching of fundamental mathematics in their school. The mean score of approximately 2.17 indicates that respondents were in agreement that the students in the school do indeed have difficulty grasping core mathematics during the time allotted for lessons.

The survey responses averaged out to 3.14. This value is comparable to 3.0 and suggests that the survey respondents had very little understanding of the factors that motivated them to study fundamental mathematics in their respective schools. This is illustrated in Table 3.

Table 3

Student's Behaviors that Influence Their Performance in Core Mathematics

QUESTIONS	N	Min	Max	Mean	SD
Absenteeism among students of core mathematics lessons is prevalent in my school	788	1	5	2.16	0.438
Tardiness of students in core mathematics class is prevalent in my school	788	1	5	4.32	1.117
Students misuse teaching materials in mathematics, which leads to poor attainment in mathematics	788	1	5	1.52	0.674
Students have insufficient utilization of learning facilities such as school libraries and mathematics labs, which leads to poor attainment in mathematics	788	1	5	2.26	0.483
Absenteeism among students in core mathematics lessons is prevalent in my school	788	1	5	1.59	1.037
Students' negative attitude toward mathematics is a reason for low attainment in the subject	788	1	5	2.37	0.618
Absence of attention by students in the mathematics class is a reason for low attainment	788	1	5	1.48	0.831
Students perceive core mathematics as too abstract based on how it is delivered in my school	788	1	5	2.31	1.152
Students escape mathematics classes by hiding in overcrowded or large classes	788	1	5	3.41	0.746
Most of the time, students do not complete fundamental mathematics homework and class activities at my school	788	1	5	2.38	1.326
Students' apprehension and fear of mathematics contribute to students' poor performance	788	1	5	1.34	0.834
Students possess low self-confidence concerning core mathematics at my school	788	1	5	2.06	0.573
Peer group influence does not support the learning of core mathematics at my school	788	1	5	2.17	0.418
Students experience low levels of happiness during core mathematics classes at my school	788	1	5	2.53	1.116
Students do not spend enough time learning core mathematics at my school	788	1	5	1.06	1.032
Students at my school possess low self-confidence in core mathematics	788	1	5	3.42	0.635
Students demonstrate negative attitudes towards core mathematics at my school	788	1	5	2.28	1.139
Students at my school struggle to grasp core mathematics lessons	788	1	5	2.17	1.005
Students lack the desire to learn core mathematics at my school	788	1	5	3.14	1.138

4.1.3 Teacher-Related Issues that Affects Students' Performance in Core Mathematics

The study examines the consequences of teacher-related factors on students' achievement in essential mathematics. Findings indicated that respondents agreed" "my mathematics instructors routinely come to class on time," registering a mean of 2.16. Respondents agreed that "mathematics' teachers do not prepare teaching aids," which registered a mean of 1.57. Respondents agreed that the relationship of core mathematics teachers to their students is extremely poor as evidenced by a mean score of 2.24. For the statement "core mathematics teachers do not most of the

time finish their syllabus," a mean score of 2.17 was registered showing that respondents were in agreement to this statement.

A follow-up on the study reported a value of 2.55, which can be rounded to 3, differentiating the uncertainty of respondents about their mathematics professors teaching more than a couple of classes a day. A 2.36 score in the mean that can be rounded to 2 confirms that respondents agreed the class size is more than what is manageable by a single teacher. A mean score of 3.42, which can be rounded to 3 means that the respondents at a point regarding the competency of core mathematics teachers. A 3.13 score from the mean reflects the respondent's uncertainty of their preference of their mathematics teacher regarding teaching and learning.

The mean score of 3.33, which can be rounded to 3 also stems from uncertainty regarding the presence of more than three mathematics teachers in their school. The 2.16 that is almost a 2 confirms the participants that agree with the negative attitude towards teaching of core mathematics teachers. A score of 2.26 that can be approximated to 2 indicates that the respondents agree with the notion that mathematics teachers use physical punishment for a wrong answer in class. The average rating of 4.37 is approximately 4, it shows that the response provided disagreed with the statement that core mathematics teachers do not care about the students' interest in the subject.

The survey revealed a mean score of 3.47 and respondents disagreed that core mathematics teachers lack pedagogical and content knowledge toward core mathematics. A mean score of 4.05 suggests that respondents disagreed that core mathematics teachers do not have an interest in students' attainment of the subject content. The survey revealed a mean score of 3.46, and this led to the conclusion that respondents disagreed that core mathematics teachers' absenteeism in the school is widespread. A mean score of 4.37 indicates that respondents disagreed that teachers of mathematics assign students homework after every lesson. The mean score of the survey is 1.45, around 2, in indicating respondents agreed that teachers of mathematics prepare examinations that are based on the content that has been covered. The survey revealed a mean score of 4.26 and this suggested that respondents disagreed that core mathematics teachers were often dissatisfied with students' lateness to the core mathematics class.

According to Table 4, 3.47 as the mean grade in the Likert scale which is nearer to 4 signifying the respondents' disagreement with the statement is interpreted as the respondents disagreed with the statement that math teachers ignore students' questions.

Table 4

Teacher-Related Issues that Affects Students' Performance in Core Mathematics

Variable of Interest	N	Min	Max	Mean	SD
The core mathematics teacher always comes to class on time	788	1	5	2.16	1.092
Math teachers improvise using instructional materials when there are no standard materials	788	1	5	1.57	1.015
The core mathematics teachers have poor teacher student relationship	788	1	5	2.24	0.738
Core mathematics teachers usually do not finish their syllabus	788	1	5	2.17	1.236
Our mathematics teacher teaches more than two to three classes in a day	788	1	5	2.55	0.631
The size of the class is larger than what the core mathematics teacher can manage	788	1	5	2.36	0.374
Core mathematics teachers apply inferior methodologies and poor teaching strategies	788	1	5	3.42	1.017
Your core mathematics teacher is jovial	788	1	5	3.13	0.429
There are three or more core mathematics teachers in my school	788	1	5	3.33	1.036
Core mathematics teachers display negative poor teaching attitudes	788	1	5	2.16	1.108
Mathematics teachers beat students when they make a mistake or give wrong answer in class	788	1	5	2.26	0.839
Core mathematics teachers are not concerned on the students' attitude toward the subject	788	1	5	4.37	1.015
Core Mathematics teachers' pedagogical and content knowledge are lacking	788	1	5	3.47	1.107
Core Mathematics teachers do not care about individual students' progress in the topic	788	1	5	4.05	0.736
Core mathematics teachers' absenteeism is frequent in my school	788	1	5	3.46	1.115
Core Mathematics teachers provide home assignments after every lesson	788	1	5	4.37	0.614
Core Mathematics teachers' question-setting for the exams is not a deviation from the coverage of the syllabus	788	1	5	1.45	0.558
Core mathematics teachers are not concerned about the students' lateness to the core mathematics lessons	788	1	5	4.26	0.438
Core Mathematics teachers do not respond to students' questions in class	788	1	5	3.47	1.132

4.1.4 Students' Performance in Core Mathematics

This research examines the students' performance in core mathematics in the selected Senior High Schools in the eastern corridor of the Northern Region of Ghana. The rating of performance in core mathematics of the selected

school was represented as follows: 5-point Likert scale was used with 1 = strongly agree, 2 = agree, 3 = not sure, 4 = disagree, and 5 = strongly disagree. The data revealed that only 8.9% of respondents have their fingers on the pulse when it comes to their performance on core mathematics and tests/exams, and 74% with a lack there of. A similarly small percentage (9.8%) had the feeling of being able to solve complex mathematical problem as with more than 70% in opposition.

The survey reported that a total of 40.3% of students reported feeling a sense of readiness towards their coursework, while 44.5% reported feelings of unpreparedness. These numbers indicate a divide in perception of academic preparedness. Only 15.9% of students expressed optimism in being able to understand the fundamental mathematics concepts taught in the course. Notably, 38.3% of the students indicated they were uncertain, and more than one-third indicated they did not have optimism. These numbers indicate that 42.1% of students reported being active participants in class discussions, while 45.7% indicated they did not participate in class discussions very much. This almost equal spread of numbers may indicate a difference in levels of student motivation and confidence, or other differences in teaching strategies. The results also indicate that students reported being able to transfer their understanding of mathematics to real-life applications very infrequently. Only 15.9% of students felt they were able to use mathematics in a context outside the classroom, while 73.7% disagreed.

The study also indicates that there was a very small portion of respondents (20%) who felt their academic performance in core mathematics was at a satisfactory level, while the majority (56.8%) indicated their performance was at a satisfactory level. A minority of respondents (18.1%) indicated that they practiced mathematics at a regular basis outside the classroom, and implies poor study habits which may lead to underachievement. The survey results also stated that only 29.4% of respondents were satisfied with their mathematics scores, while more than 55% of students indicated that they were not.

The student responses were also varied in terms of the perceived level of difficulty of the subject, where 31.1 per cent of the respondents perceived the subject as easy, 34.8 per cent believed it was hard, while 34.1 per cent were in the neutral category as shown in Table 5.

Table 5

Students' Performance in Core Mathematics

Variables	N	SA%	A%	NS%	D%	SD%
I generally do well in the Core Mathematics tests and exams	788	4.3	4.6	21.1	33.0	41.0
I feel ready for Core Mathematics tests and exams	788	13.2	27.1	15.2	41.3	3.2
I feel confident with most of the Core Mathematics concepts that are taught in my class	788	10.2	5.7	38.3	10.2	25.3
I engage fully in the Core Mathematics class and contribute in class discussions	788	15.1	27.0	12.2	33.6	12.1
I can independently do most Core Mathematics problems that are difficult	788	3.5	6.3	20.3	30.4	40.5
I can relate and utilize Core Mathematics concepts in daily life and at school	788	8.3	7.6	10.4	43.2	30.5
I see my performance in Core Mathematics as satisfactory	788	10.2	9.8	23.2	26.8	30.0
I do Core Mathematics practice exercises regularly outside the classroom	788	2.1	16.0	20.3	35.2	26.4
I am usually very satisfied with my core Mathematics grades / scores	788	18.1	11.3	15.4	31.3	23.9
I think Core Mathematics is easy to learn	788	8.8	22.3	43.1	17.6	17.2

4.1.5 Correlation Analysis

According to the correlation of the study analysis, correlation was conducted to find the reasons for the poor performance of the students in Core Mathematics in Eastern Corridor of the Northern Region of Ghana. The variables under consideration in this case were students' behaviours (STB) and teacher related issues (TRI) and performance in core mathematics (PCM). According to Table 6, performance in core mathematics (PCM) had a positive correlation with all independent variables namely students' behaviours (STB) (r=0.626, p=0.01) and teacher related issues (TRI) (r=0.807, p=0.01) as shown in Table 6.

Table 6

Correlation Analysis

	PCM	STB	TRI
PCM	1		
STB	0.626**	1	
TRI	0.807**	0.805**	1

** Correlation is significant at the 0.01 level (2-tailed).

4.1.6 Regression Analysis

This segment seeks to uncover the causes of the understudied phenomenon of underachieving in Core Mathematics of the Senior High School students in the Eastern Corridor of the Northern Region of Ghana. The study analyzed the variables, Students' Behaviours (STB) and Teacher-Related Issues (TRI) and Core Mathematics (PCM) Achievement.

The analysis also provided evidence of underperformance in core mathematics of Senior High School students in Eastern Corridor of the Northern Region of Ghana. The calculated R-square of 0.076 suggests Students' Behaviours (STB) and Teacher-Related Issues (TRI) accounted for about 7.6% of the PCM (Performance in Core Mathematics) variance, with an adverse standard error of estimate of 0.976. The adjusted (R^2) suggests 7.0% of the PCM (Performance in Core Mathematics) variance is changeable to Students' Behaviours (STB) and Teacher-Related Issues (TRI) The R-square provides an overview of the essence of the variance in PCM Achievement of Senior High School students in the Eastern Corridor of the Northern Region of Ghana. The analysis of variance, is assumed to have been accomplished through the regression equation.

The R-square, with $F = 14.489$ and $p < 0.000$, provided evidence to conclude the said variables are significantly related to one another and the relationship is consistent. This is illustrated in Table 7. As indicated from the findings and analysis, the only variable that was found statistically significant was students' behaviours (STB) (0.090, $p = 0.010$) whereas teacher-related issues (TRI) (-0.029, $p = 0.551$) had and continues to demonstrate a negative and thus statistically insignificant correlation.

$$PCM = 1.389 + 0.090X1 - 0.029X2 + 0.133X3 + 0.131X4 + e \quad \ldots\ldots 1$$

Table 7

Regression Results

Variables	Coefficient	t-Statistic	Prob.
Constant	1.389	7.810	0.000
STB	0.090	2.592	0.010
TRI	-0.029	-0.651	0.515
R	0.275		
R-squared	0.076		
Adjusted R-squared	0.070		
S.E. of Estimate	0.976		
F-statistic	14.489		
Prob (F-statistic)	0.000		

4.2 Discussion

Of the numerous phenomena examined, the students' behavior was the most influential indicator of a student's passing or failing of core mathematics. This indicates that students' disposition and efforts, or lack thereof, directly influenced their performance in the subject. This is behaviours that is a product of a particular upbringing and setting. The findings of this research mirror those of Poku (2019) in the Asafo South District, that students whose attitudes towards mathematics were positive, had a better likelihood of success. Poku (2019) also found that the attitudes of the teacher and students towards one another and towards the teacher formed one of the performance determining factors. There is also no gap attributable to gender in the achievement of mathematics.

Students' behaviors and their correlation with core mathematics results. Students' behaviors and core mathematics results correlation is positive; ($r=0.626$, $p=0.01$). it was also revealed that students' behaviors and teacher factors contributed more than 7.6% of the variance in core mathematics results and that 7.0% of core mathematics results was explained by the variation in students' behaviors and teacher factors. Based on the data, students' behaviors (0.090, $p=0.010$) was a positive and significant predictor of core mathematics results.

Concerning the factors associated with the teacher, the core mathematics teacher related variables and students' performance had a positive relationship, albeit statistically insubstantial. The challenges that mathematics teachers experience appear to serve as a hindrance to their teaching effectiveness, and in turn, the students' achievement. The results align with Kumah et al. (2023) who observed that student's gender and student's program of study are the most significant variables that predict competence in mathematics and that age has a low positive correlation. Financial status has a negative correlation with performance`. With respect to students' performance in Core Mathematics, the survey results identified low confidence and self-efficacy as predominant characteristics of the students. Some claimed to be adept at solving complex problems and performing well in assessments, it was the majority that expressed a vague understanding of mathematics signifying an inadequate instruction and assistance. Students' participation in class was equally divided in active and passive participation, but most students could not apply mathematics to real life situations, signifying an absence of relationship between the theory of the subject and its practice. A number of students were

dissatisfied with the results they achieved, did not engage in any mathematics practice outside the classroom and demonstrated little self-regulated learning.

Impact of teacher-related challenges on core mathematics performance: There are teacher-related challenges whose performance in core mathematics highly relates (r=0.807, p=0.01). Regarding students' behaviours and teacher-related challenges, more than 7.6 percent of the performance in core mathematics is explained in the study, while 7.0 percent of performance in core mathematics is explained from the variation in students' behaviours and teacher-related challenges. Based on the findings, teacher-related challenges (0.029, p=0.551) had a weak and statistically insignificant impact on students' performance in core mathematics.

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

Influence of Students' behaviour on their performance in core mathematics. There was positive correlation with students' behaviour and performance in core mathematics. There was also statistically significant positive behaviour and performance by students in core mathematics. Influence of teacher related topics on students' achievements in core mathematics. There was positive correlation to performance in core mathematics and teacher related topics. It also confirmed positive significant influence to the type of school environment on students' performance in core mathematics. To conclude, some participants reported to having a perception that mathematics was easy to learn, and it was evident that a significant number of students lacked self-perception regarding their learning.

5.2 Recommendation

There is a need for school managers to implement school-wide behaviour modification system that will not only determine, monitor, and timely reward constructive behaviours of students, but will also keep track of behaviours of students. There is also a need for educational managers to put more emphasis on professional development on engagement with students and classroom pedagogy for the benefit of teachers. It is proposed that positive reinforcement should be incorporated with the daily activities of a mathematics classroom. The training should also clarify how to positively manage and encourage the rest of the school to actively engage in the behaviour. There is a need for guidelines from the policymakers that support positive learning climate in schools.

Declaration of Interest

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