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Attitudes Coded as Measures of Determining Students' Performance in Mathematics

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Abstract: The poor performance is even a major problem in rural areas, hindering a country's economic competitiveness and development of human capital. In the school classroom, mathematics students lack the needed culture to read, understand, perform and apply tasks associated with the tasks. The aim of this study was to explore the various attitudes that measured students' performance and find relationships among the factors. Exploring the pragmatic paradigm, the researchers used the descriptive design involving structured questionnaire of four-point Likert scale. This scale suitably combined both purposive and simple random sampling procedures to select 315 participants. The instrument was structured as Strongly Agree, Agree, Disagree and Strongly Disagree to simplify responses and yield faster and higher retrieve rate. Immediately after the data collection, the responses were coded in closed form to ease data analysis. Having perused many tools of data analysis, the researchers came to the

conclusion that a combination of Pearson Product Moment Correlation Coefficient, T-test, means, standard deviation and percentages were the most appropriate. While means, standard deviations and percentages were mostly used to determine the attitudes, Pearson Product Correlation Coefficient explored the relationships among the various variables. Consequently, the results revealed that the positive attitudes of parents, teachers and schools influenced students' performance in mathematics. In fact, nearly 94% of the respondents' attribute mathematics attitudes to parents and closed to 95% attributed mathematics success to teachers. There were also positive relationships among parents, teachers and school environment in determining students' performance in mathematics. This means students with positive attitudes towards mathematics outperformed those with negative attitudes. It is recommended that parents, teachers and school heads thrive towards minimizing negative attitudes and rather maximising positive attitudes into school mathematics. We suggested that any replication of a future study should include private schools.

Keywords: attitudes coded, mathematics; measures; Pearson Product Moment Correlation Coefficient; students' performance.

Introduction

The culture of mathematics is necessary to achieve the teaching and design of life due to its vast relevance in all social contexts (Nasamu, 2021). In addition to its obvious educational value, ability to think critically and reason logically is a vital life skill that necessitates familiarity with mathematics. Learning mathematics helps one cultivate the accuracy, consistency, and mental discipline necessary for making good decisions and addressing problems in a responsible manner (Živković et al., 2022). Importance of mathematics has been emphasised by several disciplines in higher education, including the technical fields, engineering, economics, finance, agriculture, pharmacy, and health sciences (Oliver & Jorre de St Jorre (2018).

The main aim is to learn foundational as well as analytical and computational skills essential for their field of study. However, most children still find studying mathematics at the lower school levels to be extremely difficult, leading to poor or average performance as compared to other disciplines (Bernacki et al., 2021).

While students in developed countries are outperforming their male counterparts, the case of developing countries is still a misnomer (Mullis et al., 2020). The consistent demonstration of underachievement in mathematics over many years adds weight to this notion, as does the widespread acknowledgement of the value of mathematical knowledge (Rodriguez, 2023). For instance, in many developing countries, less than 32.9% of students pass mathematics examinations. Most students in the Ghana's junior high schools lack the ability to apply logic to the solution of mathematical problems, which negatively impacts their grades in the subject (Yahaya, 2021).

Iwu et al. (2019) posit that an attitude is a propensity that prepares a person to behave towards something. This propensity has some perceptual, cognitive, and behavioural components. Iwu et al. (2019) find that the students' attitudes towards Mathematics vary by gender, field, and Mathematics score, but not by grade. The teachers' approaches and activities impact on students' attitudes towards Mathematics. This suggests that students' perspectives are shaped by the type of instruction they receive from teachers (Moussa & Saali, 2022). Mathematics aversion may have been characterised in a variety of ways. Cognitive, emotional, and behavioural reactions to an item all contribute to an

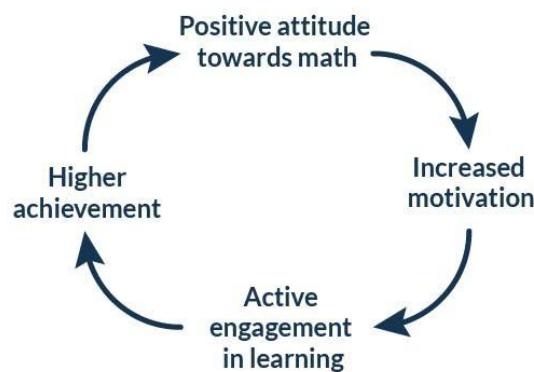
individual's attitude towards. Students' attitudes towards mathematics learning can be shaped by teachers and peers (Eccles & Wigfield, 2020).

Poor performance in mathematics is a persistent canker in rural areas, hindering the country economic competitiveness in the global market (Kiwanuka et al. 2022). Examinations bodies such as the West African Examinations Council estimated that students' mathematical abilities are much below expectation. The performance of students in the primary levels has been abysmal. The results indicate a pass rate of 25% in 2018, 30% in 2019, and 28% in 2020 (Ministry of Education, n. d.).

Closed observations and Chief Examiners reports show that the attitude of students significantly contributes to the low decline. Ogbeche et al. (2021) argue that developing countries want to succeed in today's technology-driven global economy, they must heavily invest in science, technology, engineering, and mathematics education.

Figure 1

Conceptual Framework



Source: Prodigy Education (2019).

Figure 1 suggests that the theory of attitudes can be determined by positive behaviour, increased motivation, active engagement and higher achievement influence mathematics performance. Students with positive attitudes are more confident, build self-motivation, solve mathematics tasks and attain higher achievement. The opposite can be said of students with negative attitudes (Prodigy Education, 2019).

Students are more motivated to put in effort when they have a positive outlook on mathematics learning. Positive attitudes towards Mathematics are crucial because they influence students' motivation to study the subject and can lead to a greater likelihood of majoring in Mathematics or pursuing careers in related fields (Jiang et al., 2020). Students' views towards Mathematics are a significant predictor of their enrolment in upper-level Mathematics courses.

Much of children's enjoyment and development in mathematics depend on the engagement and experience children have at home. Parents and the school can form strong synergies to enhance and foster a good mathematics learning atmosphere for the child. Poor collaboration lead to low mathematics achievement (Samuels, 2020). Adu-tutu Bofah and Ntow (2017) have demonstrated how social support of parents and teachers provide panacea to improving children' attitudes towards mathematics and achievement.

Research Problem

The poor performance has been traced to many causes. According to (Nasamu, 2021), mathematics students lack the revisit culture to understand the concepts and perform the tasks associated with the tasks. The poor performance is even pervasive in the rural areas, where students lack many requisite resources to undertake effective mathematics learning (Kiwanuka et al. 2022). This definitely led to poor or lack of application of the mathematics knowledge (Yahaya, 2021).

Another problem is the attitudes of stallholders. These stallholders are parents, teachers and students themselves. Stakeholders put little investment and resources into the teaching and learning of mathematics. It is no gain saying that very few students have the requisite books, computers and software to solve complex mathematics problems. In cases where some stakeholders secure the mathematics resources, there is little collaboration with other stakeholders. This breeds low relationship among the stakeholders (Ogbeche et al. 2021).

Research Aim and Research Questions

The aim of this study was to explore the relationships that existed between parents, teachers, schools and students in measuring performance and attitudes in mathematics. The following research questions guided the study's aim:

1. How do parents' supports improve upon students' attitudes towards mathematics?
2. What do teachers' attitudes propel students' performance towards mathematics?
3. Why does school climate promote students' attitudes towards mathematics?

Research Methodology

General Background

The researchers informed the administrators before commencing data collection. This determined when the researchers would visit their individual schools to gather the required information. At the point when the researchers showed up at the schools, they provided a letter to the relevant authorities as an indication of approval sought and granted for the data collection exercise to be undertaken in each of the selected schools. The purposive sampling procedure was first utilised to select participating schools, and a simple random sampling was employed in selecting participating students.

The present study employed both descriptive and inferential research designs. The researchers themselves designed the questionnaires based on the research questions, and thereafter derived three research hypotheses. The questionnaire items were centred on attitudes of parents, teachers and schools. Apart from students' personal information items, the questionnaire contained about 41 items, out of which six were declared redundant. The items were ranked on a five-point Likert scale, ranging from 1 (Strongly agree) to 5 (strongly disagree).

Sample and Participants

With approval from the Headteachers of the schools, the teachers invited the researchers to distribute the research instruments and to clarify certain unclear and difficult items in the instruments. Overall, two schools were chosen. The study accommodated a sample of 315 students (189 male and 128 female students), with an average age range of 14–17 years old. Students were found in their intact classroom settings while learning as we employed the simple random sampling technique. In this technique, students were first assigned numbers from 001 to 320. Then the computer was used to

generate numbers. Students whose numbers were generated were included in the sample. Out of the population of 1,500 students, the 320 was representative (Kiwauka et al. 2022).

Instruments and Procedures

The data collection procedure was split into two phases: quantitative and qualitative. The quality phase of data is dependent upon the researcher. The researchers used field assistants to collect comprehensive and in-depth data for the study. Field assistants were given extensive training on ethical considerations and the data collection procedure.

The procedure for collecting data for the quantitative phase was carried out with the aid of field assistants. Before the researchers started collecting data, the heads of the schools in the study area were sent and shown an introduction letter obtained from the Director of Education. Thereafter, the researchers discussed informed consent, privacy, anonymity, confidentiality and voluntary participation issues with the selected participants before the commencement of data collection.

The researchers then administered the questionnaire to randomly selected students. The researchers carefully administered the questionnaire, gave the participants time to complete it, and then collected it the next day. The questionnaire was distributed to a total of 320 participants, and once they completed it, the collected questionnaires were gathered for further analysis. Five participants' resources could not be retrieved due to absence from school.

In the qualitative phase, accurate data on each student's performance from each student's performance on assessments in their end-of-term scores were obtained. These records were accurately reviewed, documented, and recorded. This helped the researchers learning more about the student's academic performance and determine whether or not it was possible to link their academic performance to students' attitudes towards mathematics.

Data Analysis

Qualitative data with numbers to represent Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) were coded. Then, data with means, standard deviations, percentages and Pearson product moment correlation coefficient were analysed. The frequency tables were used for the background of students based on gender, class, age, parental status and places of living. Also, the homoscedasticity assumption was used to ensure the validity of statistical tests of Pearson Product Moment Correlation Coefficients in measuring the strength and direction of the linear relationship between continuous variables to determine the significance of the association between any two dichotomous factors.

Validity and reliability of instruments

Creswell and Creswell (2017) define the validity as the degree to which research findings properly assess the social phenomenon under examination. The construct validity determined how well the constructs were designed. The content validity determined how accurately the constructs were measured. The criterion validity measured how the same variables were compared with standard external examinations. In order to further improve the study's validity, the instrument was forwarded to highly esteemed researchers and knowledgeable academic professionals for evaluation and scrutiny. These experts were university professors, senior lecturers and graduate students in mathematics education. The Cronbach reliability coefficient was .81, far higher than the recommended 0.70. We followed and strictly abided by their wise counsel and recompilation of the instruments. This allowed for smooth and speedy implementation in the field.

Results of a Pilot Test

The instruments were pilot-tested in a neighbouring District, having similar population characteristics as the study area. In the pilot test, thirty respondents were employed for a quantitative phase, while six for the qualitative interview. The main goal of the pilot test was to evaluate the instrument's consistency, accuracy, and applicability in the context of female students' attitudes in mathematics. A test-retest technique was employed to evaluate the dependability of the quantitative instrument. In order to verify for similarities, a questionnaire was delivered to respondents to answer, and then two weeks later, the same respondents were given same questionnaire to complete. The internal consistency of the test items was then determined using the Cronbach's alpha. The values ranged between 0.78 and 0.85, which were considered to be highly reliable (Mohajan, 2017).

In the qualitative phase, six students were purposefully selected to test validity in the qualitative interview. A duration of 10–15 minutes was allotted for each interview session. For the interview protocol preparation, the researchers adapted Castillo-Montoya's (2016) method to address the following issues:

- The original questions were too wordy, convoluted, unclear, and hard for the respondents to comprehend. So, more comprehensive/concise interview questions were redesigned.
- The researchers found that some of the respondents' statements still required translation into the local dialect for clarity and explanation of unfamiliar words. So, people who could speak and write the local dialect were invited to interpret the items.
- The data collection at the research area was conducted prior to reviewing the interview questions

Ethical consideration

This study adhered to the research ethics policy, ensuring compliance with aspects such as permission, confidentiality, anonymity, informed consent and voluntary participation. Owing to the time constraints nature of data collection activities, how the researchers obtain permission from those in charge of the study area determines how reliable the research is (Ezer & Aksüt, 2021). Permission from the authorities in the study area were required in order to carry out a comprehensive analysis of the case. However, prior to collecting data, the researchers were advised to obtain consent from study participants. The following metrics were used to evaluate approval of permission as a pre-data collection requirement:

- The University's Institutional Review Board was consulted for ethical approval.
- The Municipal Director of Education was consulted for approval.
- The Headteachers/mistresses of the selected schools were asked for permission.

Informed consent

The research participants needed to be properly informed about the procedure, goals, risks, and benefits of the study as the basis for their decision to participate or not to provide informed consent. Before being enrolled in the study, research participants were given an informed consent form to sign (or verbally obtain assented to, as needed) after agreeing to participate in the study.

Confidentiality

The researchers took precautions to protect the identities and responses of the research subjects (Saunders et al., 2015). While data was being collected, the researchers ensured that no information was

directly linked to or traced back to any specific study participant, protecting the participants' identities at all times. Participations were cautioned not to write their names, addresses, phone numbers and any person identifiers on the questionnaire. Participants were assured that the data would only be used solely for academic purposes.

Anonymity

According to Feng and Wang (2019), anonymity refers to a participant's right to remain anonymous throughout a study. To help keep study participants' identities anonymous, the researchers ensured that group data were presented during the study rather than individual data. The participants' identities were duly protected except the serial codes we used in the data.

Voluntary participation

Students had to agree voluntarily to participate in the research before being given questionnaires. Students were free to ask questions before and during the filling out of the questionnaire. Students provided answers for only the questions based on their attitudes towards mathematics, effects of teachers' attitudes, /effects of parents' attitudes, and effects of classroom attitudes towards mathematics.

Research Results

Attitudes of parents, teachers and schools

This part sets up statements and measures how parents, teachers and schools influence attitude of students' performance in mathematics. In each of the three tables, there are at least ten items in each table. Parents were required to secure for their wards learning resources, inspiration, affection and conducive learning environment at home as well as emotional support and encouragement. Table 1 shows the respondents' responses to how parents' attitudes affect their performance in mathematics.

Table 1

Parental Attitudes Towards Students' Performance

S/ N	Statement	SA (%)	A(%)	D(%)	SD (%)	Mean	SD
1	My parents inspire me to study mathematics	52.4	41.3	4.1	2.2	3.43	0.68
2	My parents help me to overcome mathematics fear	41.6	44.4	10.2	3.8	3.41	2.34
3	My parents have high expectations in me	49.5	42.2	6.7	1.6	3.39	0.69
4	My parents giving me praise and reward	47.9	38.7	10.8	2.5	3.32	0.77
5	My parents monitor my studies at home	46.3	41.3	8.9	3.5	3.30	0.78
6	My parents discuss mathematics with me	42.5	47.3	7.0	3.2	3.29	0.73
7	My parents provide learning materials for me	43.8	42.9	11.1	2.2	3.28	0.75
8	My parents develop mathematics in me	40.3	50.8	4.8	4.1	3.27	0.74

9	My parents motivate me to study mathematics	37.1	38.4	19.4	5.1	3.07	0.87
10	My parents counsel me to learn mathematics	30.1	27.0	19.4	23.5	2.64	1.14
11	My parents secure mathematics textbooks for me	25.4	25.4	32.1	17.1	2.59	1.05
12	My parents allow me enough time to study	25.1	26.0	21.0	27.9	2.48	1.15
13	My parents monitor my studies at home	21.0	31.1	22.5	25.4	2.74	1.09
14	My parents make me feel loved in mathematics					3.10	0.98
	Means of mean					3.10	0.98

On Table 1, majority of respondents (93.7%) strongly agreed or agreed that if parents make them aware that, they want the best education for them and make them feel loved, it will inspire them to study hard to perform well in mathematics. Only 6.3% of the respondents strongly disagreed or disagreed. This demonstrates that parents showing their wards adequate affection and making them know that they want the greatest education for them greatly affect their positive attitudes towards performance in mathematics.

Also, an overwhelming (86.0%) agreed that such a love from their parents to encourage them to overcome mathematics anxiety and only 14% dissented. This shows that the majority of students believe they will be able to overcome their mathematics anxieties if the necessary assistance and needs are met. Another high percentage (91.7%) assented to the statement that “my parents showing me that, they have high expectations of me to perform well in mathematics will increase my interest in learning mathematics”. High positive expectation from parents is a catalyst that positively affects female students’ performance in mathematics.

The other positive parental attitudes that promote female students’ performance in mathematics are praises and rewards (86.6%), discussing importance of mathematics (89.8%), encouraging and providing mathematics resources (86.7%), setting high academic goal (91.1%), guidance and counselling services (75.5%), motivation (57%), providing conducive home (51%), and monitoring studies at home (47.9%). Based on these responses, it was evident that parental attitudes positively influence female students’ performance in mathematics.

The influence of teachers’ attitudes towards mathematics

This section provides the students’ responses on the effects of teachers’ attitudes towards their performance in mathematics. The attitudes are expanded to include the teachers’ competencies, knowledge and skills. The findings have been summarised on Table 2.

Table 2

Teacher Attitudes Towards Students’ Performance in Mathematics

Statement	SA (%)	A (%)	D (%)	SD (%)	Mean	SD
1. My teacher always encourages me to learn	54.6	38.4	5.4	1.6	3.46	0.67
2. My teacher is knowledgeable in mathematics	55.6	39.0	3.8	1.6	3.48	0.65

3. My teacher takes time to summarize facts	50.5	34.6	10.8	4.1	3.43	2.38
4. My teacher is friendly and approachable	61.0	27.3	4.7	7.0	3.42	0.87
5. My teacher praises my correct answers in class	50.8	34.6	12.4	2.2	3.33	0.78
6. My teacher marks our exercises on time	46.0	40.0	11.1	2.9	3.29	0.77
7. My teacher revises mathematics	44.1	42.5	9.8	3.5	3.27	0.78
8. My teacher makes me feel comfortable	43.8	39.4	12.4	4.4	3.22	0.83
9. My teacher does not scare me in class	32.1	28.9	21.0	18.1	2.74	1.09
10. My teacher is active in class	22.2	20.3	29.8	27.6	2.37	1.11
Means of mean score					3.20	1.10

The results on Table 2 reveal that 93% of the respondents agreed that teacher always encourages and motivates them to learn. This implies that female students yearn for encouragement and motivation from their teachers. This positively develops their attitudes towards learning and performing well in mathematics. Knowledgeable mathematics teachers (94.6.0%) make the learning simple, practical and applicable to all human contexts. Knowledge demonstrates that teachers are competent in exposing the female students to modern contemporary innovative techniques, worthy of likely imitation and improved mathematics performance.

In addition, summarising the main ideas (85%) has the propensity to increase female students' understanding better, faster and rapidly. This is supported by friendly and approachable attitudes (88.3%) so as to enable female students easily consult teachers for further and better clarification. Another positive attitude of teachers is giving praises and correct answers in class (85.4%). This encourages female students to pay rap attention and actively participate during mathematics instruction.

The other positive attitudes of teachers' worthy of emulation are marking exercises and giving feedbacks on time (86.0%), appending adequate time with female students (86.6%), making female students feel comfortable in class (83.2%), and filtering out fear in mathematics instruction (60.9%). It was revealed that even though corporal punishment has been abolished in public schools, some teachers still come to mathematics classes with canes and other gadgets that indirectly hinder mathematics learning.

The influence of classroom attitudes towards mathematics

This section investigated how classroom activities or atmosphere influenced students' performance in mathematics. About 11 items were used to analyse the influence on Table 3.

Table 3*School Attitudes Towards students' Performance in Mathematics*

Variable	SA	A	D	SD	Mean	SD
	(%)	(%)	(%)	(%)		
1. My school ensures that we understand mathematics	64.1	31.1	4.1	0.6	3.58	0.60
2. My school secures real-world examples	55.6	33.7	7.90	2.9	3.41	0.75
3. My school helps me see math as simple						
4. My school allows us to explain our answers or ideas	49.2	41.0	8.3	1.6	3.37	0.70
5. My school enable my understanding	49.2	38.4	8.3	4.1	3.32	0.79
6. My school values my ideas and suggestions	42.5	41.6	12.7	3.2	3.23	0.79
7. My school is eager to answer questions in class						
8. My school gives feedbacks about the answers	39.0	46.7	12.1	2.2	3.22	0.74
9. My school enjoys mathematics lessons	41.0	43.5	10.5	5.1	3.20	0.82
10. My school prefers working in groups	40.3	38.7	14.9	6.0	3.13	0.88
11. My school frequently get us confident	25.7	31.1	25.1	18.1	2.64	1.05
Means of mean score					3.23	0.79

The results on Table 3 show that 95.2% of respondents strongly agreed and agreed that teachers who ask prompting and probing questions help students to understand mathematics concepts and subsequently perform well. A whopping 89.3% strongly agreed and agreed that real life examples appeal more to their cognitive, affective and psychomotor consciousness and performance in mathematics. It must be emphasised that real life practical examples really assist female students in grasping, comprehending and tackling mathematics problems related to home activities. Moreover, majority of respondents (90.2%) agreed that when class teachers allow them to explain solutions, answers or ideas, they tend to understand and perform better in mathematics. It was noticed that whenever female students are even probed more by their teachers to arrive at the best solutions, they become more motivated to solve much more challenging tasks (87.6%). It could be inferred that when teachers have excellent command of the mathematics content, and willing and able to explore different strategies in teaching, female students become better beneficiary.

The other attitudes are teachers' values of mathematics towards female students' knowledge and skills in mathematics (83.1%), enjoyment, play and fun in mathematics lessons (84.5%), group collaboration and discussion in lesson study form (79.0), and striking down on female students who are

stuck during mathematics problem solving phases (56.8%). It can be concluded that the classroom itself is a mathematics catalyst to mathematics performance and must be structured, re-examined and remodelled in a mathematics friendly atmosphere.

Relationships between parents, teachers and schools

The study tested the following research hypothesis:

1. H₀: There is no significant relationship between parental attitudes and female students' performance towards mathematics.
2. H₀: There is no significant relationship between teacher attitudes and female students' performance towards mathematics.
3. H₀: There are no significant classroom attitudes and female students' performance in mathematics.

In this section, the investigators examined the relationship between the respondents' attitudes towards the study of mathematics as a topic and how it affects their mathematical achievement. Hence, Pearson Moment Correlation test was used to determine the type and degree of correlation that exists between the two variables, Attitude, and Achievement (see Table 4).

Table 4

Parents Attitudes and Mathematics Performance

Correlated variable		M	SD	Students attitude	Mathematics scores
Student's attitude	Pearson correlation	3.31	0.433	1	.229**
	Sig. (2-tailed)				.000**
	N			315	315
Mathematics scores	Pearson correlation	3.31	0.433	.229**	1
	Sig. (2-tailed)				.000**
	N			315	315

Table 4 shows that the correlation coefficient (r) between students' attitudes towards mathematics and their mathematics scores is 0.229. This indicates a positive correlation, meaning that as students' attitudes towards mathematics improve, their mathematics scores tend to increase as well.

Nasamu (2021) suggests that, depending on the student's environment and cultural background, there may be a link between parental engagement and support and student attitudes towards learning mathematics. Due to this, the researchers chose to investigate whether there was a strong relationship between parental involvement and support and improved children's attitudes towards mathematics. To analyse the connection between parents' support and students' achievement in mathematics, Person Product Moment Correlation Coefficient was employed for the analysis. With the assumption that all variables were measured continuously, the PPMCC was utilised. The degree and direction of the link between the two variables were assessed using the correlation (r) coefficient in the analysis: parental involvement/support and students' attitudes towards mathematics (SA). The relationship was investigated at a 0.01 level of confidence, two-tailed. Using the Statistical Package Service Solutions program (version 27.0), all of the questionnaire items evaluating these variables were combined into a

single item to generate scores for parental involvement/support and children's attitudes towards mathematics.

Table 5

Teacher Attitudes and Mathematics Performance

Correlated Variable		M	SD	Teacher attitude	Student attitudes
teacher competence/attitude	Pearson Correlation	3.27	0.637	1	.244**
	Sig(2tailed)				.000**
	N			315	315
student attitudes towards mathematics	Pearson Correlated	3.27	0.637	.244**	1
	Sig(2tailed)				.000**
	N			315	315

Table 5 reveals a moderately significant but positive relationship between teacher attitudes and students' performance towards mathematics in the Ghanaian context. $r = .244^{**}$, $M = 3.27$, $SD = 0.637$, $sig. = .000^{**}$ $p < 0.01$, $n = 315$, 2-tailed. The difference between the two variables (teacher competence/attitude and student attitudes towards mathematics) is .244. In terms of percentages, it is translated as 24.4%. This implies that the variables predict themselves at a rate of 24.4%, which explains why teacher competence/attitude at the Junior High level is most likely to influence the development of positive students' attitudes towards mathematics. This simply means that a teacher who is highly competent (skills-oriented) and possess an optimistic attitude towards the subject are more likely to instil a positive attitude in his students.

According to the researcher's hypothesis, the teacher/learning environment in the classroom may aid students in developing positive attitudes towards mathematics. To collect empirical evidence, the researchers sought the possibility or otherwise of correlation between Ghanaian students' attitude towards mathematics and classroom instruction/climate. PPMCC was used with the assumption that all variables (classroom instructions/climate and student attitudes towards mathematics) were computed on a continuous scale (Likert scale questionnaire).

Table 6

School Climate and Mathematics Performance

Correlated variable		M	SD	Classroom instruction/climate	Students' attitude towards mathematics.
Classroom instruction/Climate	Pearson Correlation	3.24	0.402	1	.416**
	Sig. (2-tailed)				.000**
	N			315	315
Students' attitude towards mathematics	Pearson Correlated	3.24	0.402	.416**	1
	Sig.(2-tailed)				.000**
	N			315	315

Table 6 demonstrates a moderately significant and positive relationship between classroom instruction/climate and student attitude towards mathematics in the Ghanaian context. $r = .416^{**}$, $M=3.24$, $SD=.402$, $sig. =.000^{**}$ $p<0.01$, $n=315$, 2-tailed. The difference between the two variables (classroom instruction/climate and students' attitudes towards mathematics) is 416 points, which translates to 41.6% in terms of percentage. Thus, the variables are self-predicting at 41.6%, which effectually explains why classroom instruction/climate is likely to influence students' attitudes towards mathematics learning at the Junior High level. It can be concluded that a conducive classroom climate coupled with students centred instructional method may positively affect the attitude students towards mathematics learning and performance.

Discussion

The findings from the research are discussed in this section. As in the study a quantitative method of design was used, the researchers intend to run PPMCC to measure the cause and effect, degree of significance as well as the relationship between the various variables in the study (Ali, 2021). In order to help the readers to examine how each theme reflects the interpretation used during data analysis, Ali (2021) affirm that the discussion of findings should be done separately. The primary purpose of the research was to determine the significance of association between students' attitudes towards mathematics. The findings were discussed in the following subsections.

Parents' support/involvement on students' attitudes towards mathematics

This section focuses on how parents' involvement and support can affect their children's attitudes towards mathematics. The literature concerning parental support/involvement influences students' attitudes towards learning mathematics was used to discuss and justify the findings. The findings of the study revealed considerable evidence that active parental support in children's education brings to students the tendency to develop a positive attitude towards mathematics and, as a result, such learners are more likely to earn higher grades and test scores and enrol in higher-level programs than those whose parents are not supportive (Kiwauka et al., 2022). The study yields significantly positive outcomes, suggesting that parental involvement is beneficial, since the students' responded to the statement, "my parents' encouragement and provision of math learning materials would motivate me to learn the subject" with a high percentage of agreement that their parents supporting them with learning materials and also encouraging them have a great influence on their attitude towards learning the subject. As regards the statement "I would be able to overcome my fear of learning mathematics if my parents provide me with my needs and demands as well as the assistance I require from them" the respondents indicated that parental support/involvement in their educational life do indeed influence the attitude of theirs (students) towards learning mathematics which in turn affect their performance (Ogbeche et al., 2021).

Again, the study showed that when parents or guardians are proactive in terms of their support or involvement in their children's educational lives, students are more likely to develop positive attitudes and stay focused towards their studies in mathematics. The current findings confirm the observations by Nenty et al., (2016) that, parents' support in their ward's mathematics education has a significant influence on the students' attitudes towards the subject. The study found that, students whose parents provided them with their educational needs and are more concerned and supportive would develop good attitude towards mathematics and subsequently perform better than students whose parents are non-supportive. Thus, Supportive /involved families are more likely to work together with teachers to improve their wards attitude towards learning math as well as providing learning

materials to their wards, encouraging them, motivating them, advising and monitoring them and allowing them enough time for their studies at home.

In the same vein, Nenty et al. (2016) supposed that, unfavourable attitudes towards mathematics among junior secondary school students may suggest a lack of parental involvement in their children's education in the subject. This implies that students with highly supportive/involved parents are more likely to develop a positive attitude towards the subject and thus strive harder to achieve high performance. These findings and other related research, indicate that whether or not students develop a positive attitude towards their studies is dependent on the level of parental involvement and support. A significant association is found between parental involvement and intrinsic motivation, and the development of positive attitudes in junior high school students and academic performance.

Finally, the quantitative data supported the hypothesis that parental involvement in or support of their children's education is an important determinant of junior high students' positive attitude towards mathematics in Ghana. Additionally, the findings support previous research that suggested that when parents actively participate in their children's learning, they put forth more effort, are more focused and attentive, are more drawn to the learning process, and perceive themselves as more competent, which subsequently leads to children developing a positive or good attitude towards mathematics, which is an essential factor for academic success in mathematics as well as other subjects (Lee et al., 2019).

Teachers' attitudes and students' performance towards mathematics

This section examines how teacher competence in mathematics influences students' attitudes towards mathematics learning. To discuss and support the findings, the literature concerning teacher competence/attitude influences students' attitudes towards learning mathematics was used. The researchers hold the view that teachers encouraging and motivating students to learn in the classroom and possibly being knowledgeable about the subject's content is essential to both teaching and learning. Again, it was found that teachers who spend a little more of their time summarising their lessons improve students understanding of what has been taught, which gives them the joy and confidence to learn the subject.

Also, teachers being friendly or approachable to students motivate learners to have the confidence to approach their teachers for further explanations on topics they do not understand. It was widely observed that teachers' attitudes could aid students in cultivating a positive attitude towards their lessons, therefore developing interest in their subject. This is confirmed by empirical research by Mishiwo (2022), and Slavin (2018) who reported a statistically strong correlation between teachers' mathematical competence and students' positive attitudes towards mathematics. According to the quantitative data, marking students' exercises on time, assisting them with corrections, and possibly spending more time revising with students are factors that influence students' attitudes towards math because it improves their understanding of the concepts taught.

According to Mishiwo (2022), teacher competence/attitude significantly influence the attitudes of students towards the study of mathematics. The findings are consistent with Mishiwo (2022). So, teacher's perspective and delivery style are critical determinants of the effectiveness of mathematics teaching and learning, as well as enhancing the teacher's decision-making, which in turn influences students' attitudes and interest towards the subject. Similar to the findings above, Slavin (2018) found that a teacher's competency or attitude has a substantial influence on students' attitudes towards learning mathematics. According to his findings, if teachers provide students with a lot of support and allow them being a big part of the learning process, learners can develop a more positive attitude towards their mathematics classes, which may lead to higher math scores (Slavin, 2018).

The hypothesis clearly indicated that there was a significantly moderate positive relationship between teacher attitude/competence and student attitude towards mathematics learning in the Ghanaian context. The results were reported as $r = .244^{**}$, $M=3.27$, $SD=.0.637$, $sig. =.000^{**}$ $p < 0.01$, $n=315$, 2-tailed, $n=315$, 2-tailed. The two correlated variables (teacher competence/attitude and student attitudes towards mathematics) share a variance of .244. Simply put, a highly competent (skill-oriented) teacher with a positive attitude towards the subject is likelier to instil a positive attitude in his students. Overall, this research finding is supported by a previous study that found that teachers' displays of confidence during math lessons inspire learners to develop a positive attitude towards math and thus perform better in math (Hartwig & Schwabe, 2018).

School climate and students' attitudes towards mathematics

There is growing evidence that positive classroom climate has an impact on students' behaviours towards learning mathematics. According to the findings, when teachers use real-world examples in their lessons, students' attitudes or behaviours towards learning mathematics improve. It was also discovered that teachers asking students questions during class hours allows students to share their problems with their teachers, which, when addressed, improves students' understanding of the topic taught and thus increases their interest in learning the subject. This implies that junior high school teachers who use real-world examples to introduce and teach their students are more likely to instil positive behaviours or attitudes in their students, making them confident and enjoying learning the subject (Kiwauka et al., 2022).

Respondents indicated that teachers allowing them to explain their answers or share their opinion and possibly using various or different approaches to explain a concept to them makes understanding easy for them and also makes them very confident about the subject. The results for both statements were 90.2% and 87.6%, respectively.

The data obtained from the research hypothesis tests indicates that there **was** a substantial positive association between classroom instruction/climate and students' attitudes towards studying mathematics in Ghana.

The results were reported as $r = .416^{**}$, $M=3.24$, $SD=.402$, $sig. =.000^{**}$ $p < 0.05$, $n=315$, 2-tailed. The two associated variables (classroom instruction/climate and students' attitudes towards mathematics) share a variance of .416. This implies that the more conducive a classroom environment is to learning, the more likely students are to develop a positive attitude towards the subject. The findings indicate that classroom instruction/climate is critical when it comes to students developing positive attitudes towards mathematics learning. These results support earlier studies that indicated that, students have a tendency to engage in learning more if they perceive the classroom climate as a loving and supportive environment where everyone is valued and respected. Furthermore, the results of Table 8 show that respondents stated, "I have generally enjoyed math lessons in school," yielding a mean score of 3.20 ($SD = 0.82$). This could be the result of students being exposed to a positive classroom environment. It was contended that the classroom environment can be determined by the teacher's choices, pedagogical methods, interactions with students, and teaching style.

The majority of students indicated that they preferred working in groups to working alone in mathematics class, a claim that received significant support in 80.0% of the recorded replies. This finding supports the study by Fisher et al. (2020) that, although instructors have their place, it has been found that when students are given the opportunity for discussion, conversation, asking questions, joking, and hands-on experiences, they are more engaged in the learning process. As a result, the researchers hold that teachers who promote and reward their students' thoughts and proposals

enhance their students' confidence and delight from inside. Consequentially, such pupils will be eager to participate in class by asking or answering questions.

Conclusion and Recommendations

It can be concluded that parental engagement and support had a substantial influence on students' attitudes towards studying mathematics, especially at home.

The findings revealed that teachers' competence/attitude towards teaching mathematics significantly influenced students' attitudes towards mathematics learning. Students, on the other hand, claimed that competent and well-behaved teachers inspire and motivate them to emulate them.

Again, the findings discovered that a positive classroom environment or instructions significantly impacted students' attitudes towards mathematics learning.

The implications were that attitudes of students towards mathematics significantly impacted their performance in the mathematics. Students with a positive attitude towards mathematics outperformed those with a negative attitude.

It was therefore recommended that parents, teachers and school heads thrive towards minimising negative attitudes and rather maximising positive attitudes of mathematics students.

Suggestions for Further Research

The researchers assumed that the theory of attitudes can be determined by positive behavior, increased motivation, active engagement, and higher achievement influence mathematics performance. However, the findings proved that students with positive attitudes were not more confident, self-motivated, and attained higher achievement. The researchers needed a much more robust conceptual framework that could compel students' motivation and engagement. The theory of attitudes did not achieve the desired goal as expected. Any further research should involve more participation and experiential learning rather than self-motivation.

The students were selected from public schools. Since most people in the research area lived in rural and suburban areas and rarely attended private schools, the study did not include private schools. However, in the last ten years, the area has been dominated by an influx of many private schools whose contributions to students' performance cannot be ignored. Thus, any replication of this study should take into consideration the private schools. This would enable stakeholders to obtain a comprehensive understanding and provide long-term solutions to the menace.

Literature showed that parental support/involvement influences students' attitudes towards learning mathematics. It was discovered that active parental support in children's education develops their positive attitudes towards mathematics learning and more likely higher performance. However, the Likert scale and the statements emanated from the researchers' encounters with other studies and literature. It would have been more prudent to take these statements from the students themselves. The researcher-made items must have influenced the ways they understood and responded to the questions. We believe that whenever students are allowed to talk about the problems themselves the issues of reliability and validity can be much more improved.

Parents and guardians were proactive in supporting their wards' educational pursuits and helping them to learn mathematics at home and in school. This helped the students to stay focused and more challenged. However the researchers could have gone further by bringing both parents and students in

a focus group interview. The reader would have gotten more information about the lived experiences of parents and students in support of the learning of mathematics. The independent reports of the parents and students could have minimized biases and self-gratification. Further research should bring the two groups to the same table and make them discuss areas of mathematics that need more home support and those that require school attention.

The researchers found that teachers' encouragement and motivation boosted students' teaching and learning. However, apart from the repetitions of the items for parents and teachers, it was realized that many teachers whose environment was a disadvantage to mathematics teaching had little course to motivate students to learn mathematics. The inability of some teachers to motivate students has been ignored to enhance the relevance and goal of this study. Further studies on this area should pay more attention to students' ability to work in harsh environmental conditions and with teachers with low morale to handle mathematics.

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