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Exploring how Teachers' Gender Biases and Students' Self-Efficacy Beliefs Impact Mathematics Instruction

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ABSTRACT: *The issue of gender biases among mathematics teachers and the self-efficacy beliefs of students is an intriguing subject. This study sought to explore how teachers' gender biases and students' self-efficacy beliefs impact mathematics instruction in the Adenta Municipality of the Greater Accra Region of Ghana. A sequential explanatory mixed method design was utilized in collecting data from 100 Basic school mathematics teachers and four hundred (400) Junior High School students through a closed-ended questionnaire and semi-structured interview guide. The study discovered that gender-related stereotypes and biases among teachers perpetuated gender-based misconceptions, affecting the self-efficacy of female students who were perceived to be weaker in mathematics. The study recommended comprehensive teacher training and awareness programs to help address gender-related stereotypes and biases in mathematics instruction.*

KEYWORDS: Gender biases, Students' self-efficacy beliefs, Mathematics instruction

INTRODUCTION

Gender disparities in mathematics achievement continue to persist at the pre-tertiary level of education, with boys generally outperforming girls (Ceci & Williams, 2011; Hyde et al., 2019). This disparity can limit girls' future educational and career opportunities, particularly in fields where mathematics is an essential prerequisite. Therefore, it is essential to investigate the factors that contribute to this gender disparity and explore strategies to address it. Gender disparities in mathematics education have been a longstanding concern in many countries, including both developed and developing nations. The investigation into gender and the teaching and learning of mathematics at the pre-tertiary levels of education is a critical area of research as mathematics is considered a core subject in schools worldwide, and its importance to economic and social development is well documented. Despite this, there are persistent gender disparities in

mathematics achievement at the pre-tertiary level of education, with boys generally outperforming girls (Ceci & Williams, 2011; Hyde et al., 2019). This is a matter of concern as it can limit girls' future educational and career opportunities, particularly in fields where mathematics is an essential prerequisite. One possible explanation for the gender disparities in mathematics achievement is that teachers may hold implicit biases and stereotypes about the mathematics abilities of girls and boys, which can affect their teaching practices (Cvencek et al., 2011; Hannula-Sormunen et al., 2020).

Gender-related factors can have a significant impact on the learning of mathematics for boys and girls at the pre-tertiary level of education. Research has identified several factors that can affect the engagement, achievement, and attitudes of students toward mathematics. One of the most significant gender-related factors that can influence the learning of mathematics is socio-cultural factors, such as gender roles stereotypes, and cultural expectations (Else-Quest et al., 2010; Hyde et al., 2019). Girls, in particular, may be discouraged from pursuing mathematics by societal expectations and gender roles that associate mathematics with masculinity (Else-Quest et al., 2010). For example, girls may be socialized to believe that they are not supposed to be good at mathematics or that their interests and abilities lie in other domains, such as humanities or arts (Nasir & Hand, 2008). Moreover, research has shown that girls and boys may have different attitudes towards learning mathematics (Rosenthal & Levy, 2010). Girls tend to have more negative attitudes towards mathematics than boys, perceiving it as difficult and irrelevant to their lives (Else-Quest et al., 2010; Hyde et al., 2019). Conversely, boys tend to have more positive attitudes towards mathematics, perceiving it as interesting and challenging (Else-Quest et al., 2010).

Despite significant efforts to address this issue, a persistent gap still exists between male and female students' performance and participation in mathematics at the pre-tertiary level. Numerous studies have shown that girls tend to perform lower than boys in mathematics, and they also tend to have less confidence in their mathematical abilities. Research (Carrington et al., 2016; Hannula-Sormunen et al., 2020) has shown that teachers can adopt a range of practices to support students' engagement and achievement in mathematics, including providing opportunities for collaborative and problem-solving activities, providing timely and specific feedback, promoting a positive classroom climate, and challenging gender biases and stereotypes in their teaching practices.

Statement of the Problem

Mathematics education plays a crucial role in pre-tertiary schooling. However, there persists a significant gender gap in mathematics performance, participation, and interest among students. Multiple factors contribute to this issue, including teachers' perceptions, student attitudes, societal stereotypes, cultural beliefs, and institutional biases. Despite these factors, more research is necessary to understand the impact of these factors on mathematics teaching and learning fully. Specifically, there is a lack of empirical work regarding gender and the teaching and learning of mathematics in the Adenta Municipality pre-tertiary levels of education, despite the observed

gender gap in this area. Therefore, it would be beneficial to gather empirical evidence on the following aspects: teachers' perceptions of boys' and girls' ability to grasp mathematics concepts, gender-related factors that influence the teaching and learning of mathematics, the attitudes of boys and girls toward learning mathematics, and the practices implemented by teachers to motivate and encourage students in learning mathematics in the Adenta Municipality pre-tertiary levels of education. Available studies (Baah-Korang, 2015; Cvencek et al., 2011; Hannula-Sormunen et al., 2020; Mireku, 2015; Yarkwah, 2020) have overly focused on tertiary education, senior high school education, and online learning. This has resulted in a lack of comprehensive understanding regarding potential biases or preconceptions held by educators regarding the mathematical abilities of boys and girls. This gap is critical for unveiling any gender-related disparities in teaching practices that might influence students' engagement and performance in mathematics. Additionally, a dearth of research exists comparing the self-efficacy beliefs of boys and girls and how these beliefs impact the teaching and learning of mathematics. This underscores the need for a nuanced exploration into the factors shaping teachers' perceptions and students' self-efficacy beliefs to inform targeted interventions and enhance equity in mathematics education in the Adenta Municipality.

Purpose of the Study

The study sought to explore how teachers' gender biases and students' self-efficacy beliefs impact mathematics instruction in the Adenta Municipality of the Greater Accra Region of Ghana.

Research Objectives

The study sought to:

1. explore teachers' perceptions about boys' and girls' participation in mathematics performance in the Adenta Municipality
2. compare self-efficacy beliefs of boys and girls that influence mathematics instruction in the Adenta Municipality.

Research Questions

The research questions that guided the study are:

1. What are teachers' perceptions about boys' and girls' participation in mathematics in Adenta Municipality?
2. What are the self-efficacy beliefs of boys and girls that influence mathematics instruction in the Adenta Municipality?

Research Hypothesis

H_{o1}: There is no statistically significant difference between the perception of male and female teachers about boys' and girls' inequality in mathematics in Adenta Municipality.

Theoretical Framework

The Social Cognitive Theory (SCT), developed by the renowned psychologist Albert Bandura, provides a comprehensive framework for understanding the complex interplay between individual cognitive processes, social factors, and environmental influences. With a strong emphasis on observational learning, self-efficacy beliefs, and the reciprocal relationship between individuals and their environment, SCT is an invaluable tool for investigating the impact of gender biases and self-efficacy beliefs on mathematics instruction. By examining how teachers' perceptions and attitudes towards gender can shape students' beliefs about their mathematical competence, SCT can help educators identify and address factors that may be limiting students' potential. Additionally, SCT highlights the critical role of environmental factors such as classroom practices, curriculum, and teaching methods in shaping students' beliefs and attitudes toward mathematics. By designing a curriculum that promotes gender equality and inclusivity, educators can help students develop a positive attitude towards math and improve their self-efficacy beliefs. The SCT provides a powerful framework for educators to address gender disparities in mathematics instruction. By understanding and leveraging the role of observational learning, self-efficacy, environmental factors, vicarious reinforcement, and reciprocal determination in the teaching and learning of mathematics, teachers can develop strategies that promote gender equality and inclusivity in the classroom, resulting in better outcomes for all students.

METHODOLOGY

The philosophical underpinning of the study falls under the pragmatism world of view. Babbie (2015) contends that pragmatism is not committed to any one system of philosophy and reality, thus, making it possible for researchers to draw from both quantitative and qualitative assumptions. Additionally, Creswell and Creswell (2018) stated that pragmatists do not see the world as an absolute unity which is comparable to mixed method researchers looking to many approaches for collecting and analyzing data rather than subscribing to only one way. They go further to say that pragmatism brings to the forefront multiple methods, different worldviews, different assumptions as well as different forms of data collection and analysis. The researcher considered the pragmatic paradigm to be relevant to investigating gender and the teaching and learning of mathematics at the pre-tertiary levels of education in Adenta Municipality. This study adopted the mixed-method approach which is a mixture of qualitative and quantitative approaches. A mixed method is a research design that focuses on collecting, analyzing, and combining quantitative and qualitative data in a single research or series of research. Its central assumption is that the interactive application of quantitative and qualitative methods provides a better understanding of research issues than either approach alone (Creswell & Creswell, 2018). The purpose of mixed methods research, according to Creswell (2014), is not to replace either qualitative or quantitative research, but to pull out the strengths and diminish the weaknesses in both approaches within a specific study. The researcher employed the mixed methods sequential explanatory design that consists of two distinct quantitative and qualitative phases (Creswell, 2014). Within this design, first, quantitative numeric data is collected and analyzed, followed by the qualitative text data collected

and subsequently analyzed in the sequence. The qualitative method is to clarify and elaborate on the quantitative results collected in the first phase. The quantitative data in this study is to provide further information to support or confirm the quantitative results. Some respondents were then selected as participants for the second qualitative phase. The sequential explanatory mixed method is one in which the researcher first conducts quantitative research, analyses the data, and then builds on the results to describe them using qualitative research in greater detail. The first face of the data collection consisted of a quantitative description of gender and the teaching and learning of mathematics at the pre-tertiary levels of education in Adenta Municipality. A comprehensive qualitative study then accompanied the quantitative results that explained the initial quantitative results, such as significant results, outlier results, or unexpected results (Creswell, 2014).

A target population is a group of elements or cases, whether individual, object, or event that conforms to specific criteria and to which the researcher intends to generalize the results of research **(**Creswell, 2016). The target population was Junior High School learners and teachers in the Adenta Municipality of the Greater Accra Region. The target population was one hundred and thirteen (113) Basic School Mathematics teachers and four thousand one hundred and one (4101) Junior High School learners in the Adenta Municipality. The sample size of the study was five hundred (500). This consisted of one hundred (100) Basic School Mathematics teachers and four hundred (400) Junior High School learners in the Adenta Municipality. The sample was selected through a simple random sampling technique. In this technique, a table of random numbers was generated through the computer and assigned to the participants. Any number that came up was matched with the numbers earlier assigned to the participants. This was to offer all the participants the chance of being selected to avoid bias. Out of the sample of 500 participants, eleven (11) learners and eight (8) teachers were selected for the qualitative phase. These participants were selected using a convenient sampling technique. Thus, researchers selected participants based on their easy accessibility and availability, making it a convenient and practical approach. The study employed the use of a questionnaire and semi-structured interview guide which were developed by the researcher. The researchers considered that the questionnaire was most likely to serve their research purposes concerning the students, given the large number of participants, the specific issues to be discussed, the time available to do so, and the detailed analysis that was necessary after that. The questions were assessed on a 5-point Likert scale questionnaire designed to cover items that investigate gender and the teaching and learning of mathematics at the pre-tertiary levels of education in Adenta Municipality. The questionnaire comprised closed-ended items on which respondents were asked to indicate to what extent they agreed or disagreed. Creswell (2016) was of the view that close-ended questions are easy to compile and straightforward to code, and do not discriminate unduly by how the respondents articulate. A semi-structured interview guide was used for all the interviews that were conducted in the qualitative stage after quantitative data were collected. All interview questions were framed around the research questions guiding the study. Probes were used to encourage elaboration and to clarify responses where needed. All interviews were audiotaped for later transcription and analyses. Interviewees picked available dates and places for their interviews. There are many different ways to use interviews. They can be used as

the primary means of collecting information related to research goals (Creswell, 2014). It can also be used as an analytical tool to help identify variables and relationships.

Both construct and content validity were used in this study to check if the test measured the concepts that the researcher assumed it measured. The reliability of a test or instrument refers to the extent to which it consistently measures what it is supposed to measure (Creswell, 2014). To ensure reliability, a pilot test of the instruments was carried out by administering the pretest items. The Cronbach's Alpha of the questionnaire was 0.79. According to Cohen et al. (2017), Cronbach's Alpha value of a range of 0.7 to 0.8 suggested a good strength of association. Hence, the questionnaire was considered reliable and appropriate to collect the relevant data to answer the research questions for the study. Based on this argument by Creswell (2016), ethical issues in the research included informed consent, confidentiality, and anonymity. The informed consent aimed to reassure the participants of the essence of the study and the right to withdraw if they so desire at any time. Regarding confidentiality, the respondents were assured that every bit of the personal information they provided would be kept secret. Respondents were asked to prevent the possibility of impressing the researcher with their responses. Finally, about anonymity, respondents were assured that no reference would be made to individual participants when reporting the findings and that pseudonyms would be used when necessary to quote participants. To ensure trustworthiness in this study the researcher adhered to the constructs proposed by Guba (1981), namely credibility, dependability, transferability, and confirmability.

The quantitative and qualitative data analysis procedures were employed to analyze the data and information collected. In this study, the data were initially coded and processed using version 20 of Statistical Package and Service Solutions (SPSS) software. The data file was reviewed before any analysis was conducted to check for any anomalies. Descriptive statistics such as frequencies, percentages, mean, and standard deviation were used to analyze data to answer all the research questions. The hypothesis was tested using an independent samples t-test. The qualitative analysis stage was done using thematic analysis. The researcher analyzed the interview data manually into themes. Thematic analysis is a process by which themes or trends within the dataset are identified, analyzed, and reported. The transcriptions were checked by matching what was transcribed to what was heard on the recordings and making corrections where they were identified. Each interview was transcribed and coded as soon as possible after the interviews when the information presented in the interview was fresh in the evaluator's mind. The data were analyzed based on themes considering important comments, common trends, as well as commonalities and thematic differences. The data analysis is highly interpretative in qualitative data. It is more of a reflexive, reactive interaction between the researcher and the decontextualized data that is already interpretations of a social encounter (Reicher & Taylor, 2005). In research, triangulation refers to the use of more than one method to research a phenomenon (Heale & Forbes, 2013). To address the difficulties of reliability and validity in the data sources and methods, the quantitative and qualitative data collected were triangulated (merged) to provide detailed findings of participants' views analyzed, expressed, or observed (Heale & Forbes, 2013). The results helped address the research questions by guaranteeing credibility, conformability, transferability, and dependability.

Triangulation helps the researcher to obtain a variety of knowledge on the same issue; to utilize the strength or power of each method to resolve the limitations of the other; to reach a higher degree of validity and reliability, and to resolve the limitations of single-method studies.

RESULTS AND DISCUSSIONS

This first section presents the results of the analysis of the main data. The results of the main data have been presented according to the research questions formulated for the study. Again, the responses for each research question were presented in this section.

Research Question 1: Teachers' perceptions about boys and girls participation in mathematics

This question focused on understanding teachers' perceptions regarding gender inequality in mathematics within the context of the Adenta Municipality. Specifically, the question aims to explore how teachers perceive and perceive the differences between boys and girls in their mathematical abilities, opportunities, and experiences. Gender inequality in mathematics education has been a topic of significant interest and research in educational settings worldwide. The results are presented in Table 1.

Table 1: Teachers' perceptions about boys and girls participation in mathematics

Item	M	SD
Girls are more active and talk longer in class discussions.	1.90	0.56
Girls complete their class work in time than boys do.	1.91	0.72
Girls are weaker than boys in mathematics.	4.10	0.46
Teachers have more expectations in boys than in girls	4.30	0.56
More girls than boys like Mathematics subject	2.20	0.42
Boys are more determined than girls to do well	4.50	0.21
Girls are more likely than boys to be group leaders	2.11	0.45
Girls tend to speak up more than boys.	2.32	0.16
Girls are often the weakest mathematics students	2.10	0.53
Teachers have more expectations in boys than of girls	4.43	0.26

Source: Fieldwork Data (2023).

The presented data in Table 1 consists of the results of teachers' perceptions regarding gender differences in mathematics class discussions, academic performance, leadership roles, and expectations towards achievement. From the table, the statement, "Girls are perceived to be more

active and talk longer in mathematics class discussions" (Mean = 1.90, SD = 0.56). This suggests that girls are not to be more active in class discussions. The standard deviation of 0.56 indicates a moderate level of variability in teachers' responses. The mean value of 1.90 suggests that, on average, teachers do not strongly agree that girls are more active and talk longer during mathematics class discussions. Also, the statement, "Girls are more likely to speak up during mathematics class discussions compared to boys" attracted (Mean = 2.11, SD = 0.16).The results indicate that, teachers disagree to some that girls are more likely to speak up during mathematics class discussions compared to boys. The low standard deviation suggests a strong consensus among the teachers, with little variation in their perceptions. The statement, "Girls are perceived to complete their class work in time more than boys do" had (Mean = 1.91, SD = 0.72). The mean value of 1.91 indicates that, on average, teachers perceive girls to complete their class work in time more than boys. The mean value suggests that teachers lean towards agreement with the statement but to a relatively moderate extent. The moderate standard deviation of 0.72 indicates some variability in teachers' perceptions. Some teachers may strongly agree that girls complete their class work on time, while others may have a weaker agreement with the statement.

Furthermore, Girls are perceived to be weaker than boys in mathematics (Mean = 4.10, SD = 0.46). The mean value of 4.10 indicates that, on average, teachers perceive girls to be weaker in mathematics compared to boys. The mean value suggests that teachers lean towards agreement with the statement but to a relatively moderate extent. The relatively low standard deviation of 0.46 indicates that there is less variability in teachers' perceptions. Most teachers tend to agree that girls are perceived as weaker in mathematics compared to boys. More girls than boys are perceived to like the Mathematics subject (Mean = 2.20, SD = 0.42). The mean value of 2.20 suggests that, on average, teachers perceive more girls to like the Mathematics subject. The mean value indicates that teachers tend to agree with the statement but to a relatively moderate extent. The moderate standard deviation of 0.42 indicates some variability in teachers' perceptions. Some teachers may strongly agree that more girls like Mathematics, while others may have a weaker agreement. Boys are perceived to be more determined than girls to do well in mathematics (Mean = 4.50, SD = 0.21). The mean value of 4.50 indicates that, on average, teachers perceive boys to be more determined to do well in mathematics compared to girls. The mean value suggests that teachers agree with the statement to a relatively high extent. The low standard deviation of 0.21 indicates little variability in teachers' perceptions. Most teachers strongly agree that boys are perceived as more determined to excel in mathematics. Girls are perceived to be more likely than boys to be group leaders during mathematics group work (Mean = 2.10, SD = 0.45). The mean value of 2.10 suggests that, on average, teachers perceive girls to be more likely to take on group leadership roles during mathematics group work. The mean value indicates that teachers agree with the statement but to a relatively moderate extent. The moderate standard deviation of 0.45 indicates some variability in teachers' perceptions. Some teachers may strongly agree that girls are more likely to be group leaders, while others may have a weaker agreement.

Teachers have more expectations in boys than in girls towards mathematics achievements (Mean = 4.30, SD = 0.56). The mean value of 4.30 indicates that, on average, teachers have higher expectations for boys' mathematics achievements compared to girls. The mean suggests that

teachers agree with the statement but to a relatively moderate extent. The moderate standard deviation of 0.56 indicates some variability in teachers' perceptions. Some teachers may strongly agree that they have higher expectations for boys, while others may have a weaker agreement. Teachers have more expectations in boys than in girls towards mathematics achievements (Mean = 4.40, SD = 0.26).

The mean value of 4.40 indicates that, on average, teachers have higher expectations for boys' mathematics achievements compared to girls. The mean value suggests that teachers agree with the statement to a relatively high extent. The low standard deviation of 0.26 indicates little variability in teachers' perceptions. Most teachers strongly agree that they have higher expectations for boys' mathematics achievements.

Confirming the results of the questionnaire data, the excerpts of the teachers' interview responses provide support to the quantitative results. The teachers' shared their views:

> *"In my experience, I have noticed that girls tend to be more active and participate actively in mathematics class discussions. They often contribute to discussions, ask questions, and share their thoughts on the topic. On the other hand, boys sometimes take longer to warm up to the discussion and may be less vocal during the initial stages of the class".*
>
> *"Based on my observations, I have noticed that girls are generally more organized and diligent in completing their class work on time. They often submit their assignments promptly and show consistency in meeting deadlines. However, it's important to note that individual student behavior can vary, and some boys are also very responsible and punctual with their class work".*
>
> *"As a teacher, I strive to avoid gender-based stereotypes, and I believe that both girls and boys have equal potential in mathematics. However, I have come across instances where some girls may lack confidence in their mathematical abilities due to societal perceptions or past experiences. It's crucial to provide all students, regardless of gender, with a supportive learning environment that fosters their self-belief and helps them excel in mathematics".*
>
> *"From my interactions with students and colleagues, I have observed that there seems to be a perception that boys have higher expectations for academic achievements in mathematics. Some teachers may unintentionally give more attention and encouragement to boys in the subject, assuming that they are naturally more inclined towards math. However, it's essential to treat all students equally and provide them with equal opportunities to excel in mathematics"*
>
> *"In my experience, I have seen both boys and girls who display determination and enthusiasm to excel in mathematics. While some boys may be vocal about their aspirations and goals in the subject, some girls are equally determined and ambitious in their pursuit of excellence in mathematics. It's essential to*

acknowledge and support the efforts of all students, irrespective of their gender, to foster a positive learning environment that encourages their passion for mathematics".

Research Question 2: Self-efficacy beliefs of boys and girls in mathematics

This research question sought to understand the self-efficacy beliefs of both boys and girls in the context of mathematics education in Adenta Municipality. Self-efficacy refers to individuals' beliefs in their capabilities to successfully perform specific tasks or achieve certain outcomes. In the context of mathematics learning, self-efficacy beliefs play a crucial role in students' motivation, engagement, and academic performance. The results is presented in Table 2.

Table 2: Self-efficacy beliefs of boys and girls in mathematics

ITEM	M	SD
I am confident in solving complex mathematical problems.	2.30	0.13
I can improve my mathematics skills through hard work and practice.	4.21	0.27
I am capable of understanding/grasping mathematics concepts.	4.13	0.43
I believe I can perform as well as my peers in mathematics.	4.30	0.33
I can manage to overcome difficulties in mathematics.	3.15	0.23
I feel anxious or fearful about mathematics-related tasks.	4.64	0.19

Source: Fieldwork Data (2023).

Table 2 presents the results of a research question that investigated the self-efficacy beliefs of boys and girls in the teaching and learning of mathematics. From the results, the statement, "I am confident in my ability to solve complex mathematical problems (Mean = 2.30, SD = 0.13). The result indicates that, on average, both boys and girls have a moderate level of confidence in their ability to solve complex mathematical problems. The mean value being below the neutral value of 3 suggests that respondents, in general, have a somewhat lower level of confidence in their problem-solving abilities. Similarly, the statement, "I believe that I can improve my mathematics skills through hard work and practice" attracted (Mean = 4.21, SD = 0.27). The result indicates that both boys and girls generally believe in their capacity to improve their mathematics skills through hard work and practice. The mean value above the neutral value of 3 suggests that respondents have a positive self-efficacy belief in their potential for skill improvement. The results of the statement, "I feel capable of understanding and grasping mathematical concepts had a Mean of 4.13 and a standard deviation of 0.43. This indicates that both boys and girls generally feel capable of understanding and grasping mathematical concepts. The mean value above the neutral value of 3 suggests that respondents have a positive self-efficacy belief in their ability to

comprehend mathematical concepts. Also, the respondents have a positive self-efficacy belief in their performance capabilities compared to their peers. This is evident in the mean and standard deviation of the statement, "I believe I can perform as well as my peers in mathematics" (Mean = 4.30, SD = 0.33). The finding indicates that both boys and girls believe in their ability to perform at the same level as their peers in mathematics**.** The statement, "I can manage to overcome difficulties while learning mathematics" gained a mean of 3.15 and a standard deviation of 0.23. The result indicates that, on average, both boys and girls have a moderate belief in their ability to overcome difficulties while learning mathematics. The mean value above the neutral value of 3 suggests that respondents generally possess some confidence in their problem-solving skills. The finding indicates that both boys and girls, on average, report feeling anxious or fearful about mathematics-related tasks (Mean = 4.64, SD = 0.19). The mean value is significantly above the neutral value of 3 suggesting that respondents generally experience a high level of anxiety or fear related to mathematics.

The responses from students on their self-efficacy beliefs are evident in the following abstract. Commenting on their self-efficacy beliefs, some students shared the following:

> *I firmly believe that continuous hard work and practice can significantly improve my mathematics skills. Whenever I face areas where I feel less confident, I dedicate extra time to practice and seek additional resources to reinforce my understanding. This approach has proven effective in enhancing my math abilities and boosting my self-confidence in the subject."*
>
> *I feel quite capable of understanding and grasping mathematical concepts. I find that when I actively engage in class discussions and ask questions when needed, I can better comprehend complex mathematical concepts. Additionally, I take the time to review class materials and seek clarification from my teacher or peers when necessary, which helps me reinforce my understanding of various mathematical topics."*
>
> *I believe I can perform on par with my peers in mathematics. I don't compare myself to others, but I focus on continuous improvement and challenging myself to do better. I feel that every student has their own strengths and weaknesses, and we all have the potential to excel in mathematics with effort and determination."*
>
> *"Whenever I encounter difficulties while learning mathematics, I adopt a proactive approach. I seek help from my teacher or classmates, participate in study groups, and use online resources to gain a deeper understanding of the challenging topics. I also practice regularly and review my mistakes to learn from them. This perseverance and determination have helped me overcome many obstacles and grow as a mathematics learner."*
>
> *"At times, yes, I do feel anxious or fearful about mathematics-related tasks, especially when facing important exams or challenging assignments. However, I*

try not to let these emotions overwhelm me. Instead, I take deep breaths, remind myself of my capabilities, and focus on the steps I need to take to tackle the task at hand"

Testing Hypothesis

H_{02}: There is no statistically significant difference between the perception of male and female teachers in mathematics in Adenta Municipality.

Table 3: Teachers' perception about boys and girls in mathematics

Sex	N	Mean	Std. Dev.	T	Df	Sig-Value
Male	83	26.4	3.9			
				0.427	98	0.641
Female	17	24.1	5.0			

Source: Fieldwork Data (2023).

The results in Table 3 show that the sig (2-tailed) value is 0.641. This value is greater than the cut-off point of 0.05 (P>0.05). Therefore, there was no statistically significant difference between the perception of male and female teachers about boys' and girls' inequality in Mathematics in Adenta Municipality. The results from Table 11 indicate that there is no statistically significant difference between the perception of male and female teachers about boys' and girls' inequality in mathematics in Adenta Municipality. The mean perception score for male teachers was 26.4, while the mean perception score for female teachers was 24.1. The standard deviations for both groups were 3.9 and 5.0, respectively. The p-value (sig=0.641) obtained from the statistical analysis shows that the probability of observing such a difference in perception scores between male and female teachers by chance alone is relatively high. Since the p-value is greater than the standard significance level of 0.05 (P>0.05), there is no statistically significant evidence to reject the null hypothesis (H_{o1}) that there is no difference in the perception of male and female teachers about boys' and girls' inequality in mathematics.

DISCUSSIONS OF RESULTS

From the results of research question 1, it is evident from the analyses of both quantitative and qualitative results that teachers perceive that girls tend to be more active and vocal during mathematics class discussions, which may indicate that girls actively engage and participate in classroom interactions. This finding aligns with research suggesting that girls often demonstrate strong verbal skills and are more likely to actively contribute to classroom discussions. Teachers' perceptions indicate that they believe girls are more diligent in completing their class work on time compared to boys. However, it is concerning that teachers perceive girls to be weaker in mathematics. This perception may contribute to the perpetuation of gender stereotypes and biases, affecting girls' self-confidence and opportunities in the subject. The perception that more girls like mathematics subject may indicate that some girls show interest in the subject. However, the

perception that boys are more determined to excel in mathematics may highlight the existence of expectations and pressures on boys to perform well in the subject. The perception that girls are more likely to be group leaders during mathematics group work could reflect positive attributes attributed to girls in collaborative settings. The data reveals that teachers' perceptions suggest that they have higher expectations for boys' mathematics achievements compared to girls. This finding raises concerns about potential bias and the impact on girls' academic experiences and opportunities. The finding that teachers perceive girls to be more active and vocal during mathematics class discussions aligns with previous research suggesting that girls often demonstrate strong verbal skills and are more likely to actively participate in classroom interactions (American Association of University Women, 2010). This finding may be related to social and cultural factors that encourage girls to be more expressive and engaged in verbal communication. The perception that girls are more diligent in completing their class work on time compared to boys also finds support in the literature that indicates girls tend to be more organized and responsible in their academic work (Duckworth & Seligman, 2005). This perception may be influenced by societal expectations and norms regarding girls' behavior and academic performance. The concerning perception that teachers believe girls are weaker in mathematics contrasts with research suggesting that gender differences in mathematics performance are not significant or that girls perform on par with boys in the subject (Hyde et al., 2019). This perception may reflect deeply ingrained gender stereotypes and biases about girls' academic abilities in mathematics, which can have detrimental effects on girls' self-confidence and academic performance. The perception that more girls like the Mathematics subject may align with some research indicating that girls may show equal interest and ability in mathematics compared to boys (Else-Quest et al., 2010). However, the perception that boys are more determined to excel in mathematics may reflect societal expectations and pressures on boys to perform well in traditionally "masculine" subjects, which may affect their motivation and engagement in mathematics.

The quantitative and qualitative results for research question 2 suggest that both boys and girls in the study demonstrate positive self-efficacy beliefs in various aspects of mathematics learning. They generally believe in their potential for skill improvement through hard work and practice, their ability to understand mathematical concepts, and their capability to perform on par with their peers in mathematics. However, the study also reveals that respondents report feeling moderate levels of confidence in solving complex mathematical problems and managing difficulties while learning mathematics. This may indicate a need for targeted support and interventions to boost their confidence in tackling more challenging tasks. One noteworthy finding is that respondents, on average, experience a relatively high level of anxiety or fear related to mathematics. This highlights the importance of addressing math-related anxiety and fostering a supportive learning environment that helps students build confidence and reduce apprehension in mathematics. The finding that both boys and girls in the study demonstrate positive self-efficacy beliefs in various aspects of mathematics learning aligns with Bandura's Social Cognitive Learning Theory. According to the theory, self-efficacy refers to an individual's belief in their ability to succeed in specific tasks and situations. Students' positive self-efficacy beliefs in mathematics may be

influenced by their past successes, feedback from teachers, and observation of others successfully performing mathematical tasks (Pajares, 2006). Positive self-efficacy beliefs can motivate students to actively engage in learning and persist in challenging tasks, ultimately leading to improved academic performance (Bandura, 1997). The finding that respondents report feeling moderate levels of confidence in solving complex mathematical problems and managing difficulties while learning mathematics is consistent with previous research on students' math-related self-efficacy. Studies have shown that students often have lower self-efficacy when it comes to more complex or challenging tasks in mathematics (Pajares, 2019). This could be attributed to the belief that such tasks require higher levels of skill and may be more difficult to accomplish. The finding that respondents, on average, experience a relatively high level of anxiety or fear related to mathematics is also supported by existing literature. Math anxiety is a common phenomenon among students and can have a significant impact on their academic performance and motivation in the subject (Ma & Xu, 2004). High levels of math anxiety may hinder students' ability to focus, comprehend mathematical concepts, and perform well on math-related tasks.

Study Findings

The findings of the study revealed that:

1. Teachers' perceptions can reinforce gender-related stereotypes and biases in mathematics education. While girls are often perceived as active participants in discussions and group work, they are also seen as weaker in mathematics, which can negatively impact their self-confidence. Additionally, when teachers have higher expectations for boys' academic achievements, it can inadvertently put girls at a disadvantage in terms of opportunities and recognition of their capabilities.

2. Both boys and girls in the study exhibited positive self-efficacy beliefs across various aspects of mathematics learning. They generally believe in their potential for skill improvement through hard work and practice, their ability to comprehend mathematical concepts, and their capability to perform on par with their peers in mathematics.

CONCLUSIONS AND RECOMMENDATIONS

In conclusion, the study sheds light on the issue of gender stereotypes and biases in mathematics instruction among students. Regardless of the active participation in math-related activities by girls, teachers continue to perpetuate these biases, ultimately affecting their self-confidence. The study recommends that headteachers take proactive measures to address and combat these biases and that teacher training and awareness programs should be implemented to create a more inclusive and equitable learning environment. It's worth noting that this study was conducted in a specific context of Adenta Municipality of the Greater Accra Region of Ghana and may not apply to other regions. Further study could explore the effectiveness of implementing such training programs in reducing gender-related stereotypes and biases in mathematics instruction and striving for greater inclusivity can help create a more empowering educational experience for all students.

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