



JOURNAL OF TERTIARY EDUCATION AND LEARNING (JTEL)

ISSN: 2994-4015 (Online)

VOLUME 2 ISSUE 2 (2024)



PUBLISHED BY
E-PALLI PUBLISHERS, DELAWARE, USA

Improving Girls' Participation in Mathematics at Dormaa Akwamu R/C Primary Three (3) Using Motivational and Gender – Sensitive Approaches

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Article Information

Received: June 09, 2024

Accepted: July 12, 2024

Published: July 15, 2024

Keywords

Gender-Sensitive Approach, Motivational Approach, Mathematics, Pupils, Performance, Participation

ABSTRACT

This study used motivational and gender-sensitive approaches to improve the participation of girls in mathematics at Dormaa Akwamu R/C Primary School, with a specific focus on three basic (3) pupils. The research utilized an action research approach and qualitative research design, and employed convenient and purposive sampling methods to gather data. The data was collected using observation, test, and interview methods, and was analyzed using descriptive statistics such as frequencies and percentages. The accessible population for the study was 27 pupils in Basic three (3). The study revealed that female students in Basic three (3) at Dormaa Akwamu R/C Primary School had a negative attitude towards mathematics, resulting in a lack of interest in the subject and poor participation, which affected their academic performance. Also, the study found that the low perception of the class teacher towards girls and the socioeconomic status of the girls' families significantly impact girls' performance in mathematics. However, using motivational and gender-sensitive approaches in mathematics instruction helped enhance female students' performance. Based on the results, the researchers suggest that teachers should use motivational and gender-sensitive approaches to improve the academic performance of their pupils. This study will serve as a guide for how girls can effectively learn mathematics and related subjects in Ghanaian classrooms.

INTRODUCTION

Mathematics is a diverse subject that involves working with various types of information, including data from surveys, scientific observations, reasoning, and numerical simulations. The fundamental concepts of mathematics are rooted in counting, adding, subtracting, multiplying, and dividing. As cited by Khan (2015) mathematics is often associated with problem-solving, it also involves creativity, intuition, and imagination to discover new ideas and solve complex problems. Unfortunately, the perception that mathematics is a subject for males has been prevalent in society, leading to discrimination against girls and women (Eccles, 2011).

Kuzmina (2016) states that girls show lower participation and performance in mathematics as compared to boys due to their lesser interest in the subject. This gender gap in mathematics education could be a contributing factor to the gender disparity in the STEM fields. A study by Shumow and Schmidt (2013) has shown that even among high-ability students, girls tend to have a lower level of mathematics self-confidence and interest compared to boys. Again, from the same work the gender difference in attitudes towards mathematics, in favor of boys, is larger among high-ability students than for average-ability students. As cited in Kuzmina (2016), an International comparative study on education indicate that gender differences exist among students' attitudes toward mathematics in every country that participates in these studies. Even in countries where there are no gender differences in mathematics achievements, boys

report higher self-assessments in mathematics and a more positive attitude towards the subject. A research work by Eccles (2007) has shown that girls tend to have a lower level of mathematics interest and self-confidence compared to equally able boys. Again, a study by Denteh, Mensah and Issaka (2017) have also confirmed that boys tend to have a higher level of interest and self-concept in mathematics.

However, many researchers have also pointed out that increasing the number of females in the study of mathematics can play a significant role in the development of a nation (Shumow & Schmidt, 2013).

Early elementary school is when a little gender disparity in attitudes toward mathematics first emerges. Mathematical self-confidence and value beliefs decline over schooling for both boys and girls, despite evidence of a decline in both extrinsic and intrinsic desire for the subject (Denteh *et al.*, 2017). According Baah-Korang *et al* (2015), girls' desire for and self-assessment in mathematics is declining more than that of boys.

Presently, there exists a department for Girls Education at the District/Municipal Offices of the Ghana Education Service (G.E.S). Several scholarship programs have been implemented specifically for girls, and documentaries have been produced to showcase the potential of the girl-child given equal opportunities as her male counterpart. Additionally, Science, Technology, and Mathematics Education (STME) clinics are organized annually to encourage and empower girls in these fields (Asante, 2010). In spite of the attempts made by the government,

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NGOs, and individuals to provide equal educational opportunities for boys and girls, many girls are still struggling to participate in math classes, which is leading to their poor performance in grade three at Dormaa Akwamu R/C Primary School. This poor performance in math can also negatively impact their performance in other subjects. Therefore, the researcher plans to conduct a study to enhance girls' participation in math classes using Gender-Sensitive and Motivational teaching approach.

Statement of the Problem

Mathematics is considered to be a crucial subject, but some girls in basic school face difficulties while participating in mathematics lessons. Various studies indicate that gender plays a significant role in mathematics performance, with males generally performing better than females. For instance, results from the Assessment of Performance Unit (APU) in the United Kingdom revealed that boys outperform girls in all mathematics content areas at 11 years of computation (Asante, 2010). Additionally, Hanna (1980) reported that eighth graders in Ontario showed a difference in favor of boys in geometry and measurement. This situation is similar in the Basic 3 pupils at Dormaa Akwamu R/C Primary in the Dormaa East District of Bono Region of Ghana. During the researcher's off-campus teaching practice at Dormaa Akwamu R/C Primary School, it was observed that most of the girls in class 3 were not enthusiastic about participating in mathematics class activities. Again, it was seen that only boys raised their hands to answer questions while girls' participation remained low. Moreover, the researchers conducted a pre-intervention test and found that girls had scored poorly, which confirmed that the girls are not good at math. As a result, the researcher decided to embark on the study titled "Improving Girls' Participation in Mathematics at Dormaa Akwamu R/C Primary Three (3) Using Motivational and Gender-Sensitive Approaches".

Purpose of the Study

The study is to use motivational and gender sensitive approaches to improve girls' participation in mathematics in basic three (3) pupils of Dormaa Akwamu R/C Primary School.

Research Objectives

The objective of the study is to:

1. Identify the causes of poor participation of girls in mathematics lessons in basic 3 at Dormaa Akwamu R/C Primary School.
2. Establish appropriate approaches to improve the participation of girls in mathematics lessons in basic 3 at Dormaa Akwamu R/C Primary School.

Research Questions

In order to determine the objectives of the research, the study investigated the following set of research questions:

1. What are the causes of the poor participation of girls

in mathematics lessons in basic 3 at Dormaa Akwamu R/C Primary School?

2. What approaches can be adopted to improve the participation of girls in mathematics lessons in basic 3 at Dormaa Akwamu R/C Primary School?

LITERATURE REVIEW

In this section, we examine various research and literature related to the progress of mathematics achievement with a specific focus. The main objective of this literature review is to explore the existing research conducted in the chosen field of study and also to identify the areas that need more attention. Additionally, we aim to find similar work done within the domain, highlight potential areas for further research, critique the existing findings, and suggest future studies. This literature review serves as the groundwork for building a comprehensive theoretical framework and developing a hypothesis for testing. The subsequent section includes some subheadings that we used to review the related literature for this study.

1. Causes of poor participation of girls in mathematics.
 - The socio-economic status of student
 - Teachers' Expectations from Students
 - Girl's negative attitude towards mathematics.
2. Strategies used to improve the participation of girls in mathematics.
 - Motivating girls while teaching and learning mathematics
 - Gender-sensitive approach.

Causes of Poor Participation of Girls in Mathematics

The low or poor participation of girls in the Dormaa Akwamu basic three can be related to several considerable factors. Below are some factors responsible for the poor participation of girls in mathematics at the Dormaa Akwamu R/c basic 3.

The Socioeconomic Status of the Students

A child's academic performance can be influenced by the level of education, income, and occupation of their parents. Studies have shown that parents with higher socio-economic status are more involved in their children's education, which motivates their children to perform better in school. On the other hand, low socio-economic status can negatively affect a child's academic achievement as it can create a stressful environment at home and limit access to educational resources. This can lead to increasing chances of school dropout, especially for students from single-parent households who may struggle with parenting and time-management issues (Majoribanks, 1996). Hence, a student's socio-economic status significantly impacts their academic performance and can determine the quality of their home life.

Teachers' Expectation and Perception Towards Gender and Mathematics Participation

Teachers tend to have lower academic expectations for girls than for boys and treat them differently. Boys are

praised for their ability and criticized for not working hard, while girls are complimented on their hard work and neat performance when they excel in mathematics and are told they are not bright when they fail. Boys receive more help from teachers in areas where they struggle academically and are called on more often to answer in class, while girls attend to the teacher less often (Gallagher & Kaufman, 2005). As stipulated by Eccles (2011), when expectations of future success are low, students tend to avoid the subject in the future. Hence, girls' performance in mathematics is negatively affected by the belief that girls are not as bright or hardworking as boys, and very few girls study mathematics (Eccles, 2011). Researchers have studied the potential psychological, biological, and social reasons for gender differences in mathematics. Riegler-Crumb *et al.*, (2006) asserted that Girls' lower performance in mathematics is attributed to factors such as lower perceived support for learning mathematics, unattractive, uncomfortable, and hostile classrooms, and teachers and peers. Teachers' personal beliefs, attitudes, and stereotypical perceptions affect their thoughts and classroom practice. As indicated by Eccles and Roeser (2011), the difference in attention given by teachers to male or female students and their set expectations of each teacher could be the cause of differences in interaction and treatment to their students, leading to differences in their students' achievement in mathematics. Studies conducted in Africa and other regions of the world have suggested that teachers' personal beliefs, attitudes, and stereotypical perceptions have an impact on their thoughts and classroom practices (Jones and Dindia, 2004). A research by Allard (2004) has also shown that teachers' attention towards male or female students and their stereotypical beliefs towards their abilities could be a reason for differences in their interaction and treatment to their students, ultimately leading to differences in their achievements in mathematics. The reason behind why more boys progress in mathematics than girls is possibly due to these differences in teachers' interaction. Eccles (2011) research reported that teachers interact more with boys, and call on and praise them more than girls.

Girls' Negative Participation in Mathematics

Mathematics is a crucial part of every school curriculum in Ghana, and it is mandatory for all students to study it. However, studies indicate that over 80% of Ghanaian students fail to meet the low international benchmark in mathematics. This implies that most students lack a sound understanding of fundamental mathematical concepts. According to Eccles (2007), female students are less successful in learning mathematics due to their low interest, poor self-confidence, and low academic expectations. Research has shown that girls in mixed schools express the least success and confidence in mathematics, and they tend to have higher mathematics anxiety (Allard, 2004). Additionally, some studies suggest that students often lack motivation and confidence when it comes to learning mathematics. Girls, in

particular, often perceive mathematics as a challenging subject reserved for boys, which negatively affects their performance in math and other science-related subjects (Denteh *et al.*, 2017). Attitude is considered a crucial factor that affects an individual's performance in learning activities. Unfortunately, it is culturally acceptable in the UK to have a negative attitude towards mathematics, which often leads to the misconception that math is a skill possessed only by a rare few and inaccessible to the general public.

Strategies Used to Improve the Participation of Girls in Mathematics

To motivate and encourage Dormaa Akwamu basic three girls to participate effectively in mathematics, there should be remedies to adhere to. The following are some strategies that review how girls' participation in mathematics could be improved.

Motivating Girls during Teaching and Learning of Mathematics

It is important to understand the reasons behind students' positive or negative attitudes towards mathematics in order to encourage their motivation towards learning. Negative perceptions of math can lead to students opting out of math classes (Asimeng-Boahene, 2007). Teachers should strive to create a collaborative and supportive classroom environment that encourages student participation and discourse. By being flexible and responsive to students' feedback, teachers can help improve their ways of teaching. According to Hodgen *et al.*, (2013), making students aware of the personal benefits of advanced math qualifications can lead to increased participation.

Mathematics Teachers Adopting the Gender-Sensitive Approach to Learning

Gender refers to the societal interpretation of various physical, biological, mental, and behavioral traits that distinguish males and females. It is a social and cultural construct that defines the roles, access to, and control over resources between men and women. Gender sensitivity is a behavior that promotes fairness by recognizing and accepting the differences between males and females. It is a way of thinking that respects and empathizes with others, regardless of their dissimilarities. Teachers should provide equal opportunities for both genders in mathematics classrooms, and also be mindful of the needs of female students. Strong female role models are crucial in helping young women discover their enthusiasm for mathematics and boosting their confidence in their academic abilities. According to Bandura (2007), people learn from one another through imitation, observation, and modeling. Children tend to emulate the attitudes and actions of their teachers, so leading by example is the easiest initial step. Something as simple as taking turns with your student to do different activities can defy the stereotype that certain activities are gender-specific. At Dormaa Akwamu R/C Primary 3, the proper utilization

of motivation and gender sensitivity led to both boys and girls being actively involved in mathematics lessons. After the intervention was effectively implemented, mathematics lessons became engaging, and the

contribution of girls was highly encouraging. As shown in Figure 1, girls were eager to participate in answering questions just as boys did in mathematics lessons.



Figure 1: Girls motivated to answer questions in mathematics lesson

Figure 1 illustrates that almost all learners in class three were eager to answer questions after effective motivation and gender-sensitive strategies were used.

Summary

In the second chapter, it was discovered that the researcher had examined a range of literature related to the study. The literature reviewed discussed the factors contributing to girls' poor participation in mathematics, including the socio-economic status of students, teachers' expectations from students, and girls' negative attitudes towards mathematics. Additionally, the literature suggested strategies that could be implemented to improve girls' participation in mathematics, such as teachers motivating girls during the teaching and learning process and adopting a gender-sensitive approach to teaching.

METHODOLOGY

The research conducted in this study followed a qualitative research design and used action research methods to gather data. Amedahe (2000) asserts that the Action Research design offers numerous benefits. Among the benefits are that it supports the researcher's use of scientific approaches to tackle classroom difficulties. Additionally, it makes it easier for instructors to find simple answers to issues in the classroom when they employ action research methodology. Furthermore, it is collaborative in that it incorporates both the instructor and the students in the joint investigation. Action research has many drawbacks in spite of its advantages. This is due to the fact that its focus is on fixing particular issues in the industry or in schools, not adding to general knowledge, therefore the results cannot be used generally. The study was conducted in Dormaa Akwamu R/C Primary School with

a total population of 200. The study involved selecting a sample size of 27 subjects, which comprised of 14 girls and 13 boys from basic three in Dormaa Akwamu R/C Primary School. The researcher chose basic three pupils for the study as she was assigned to that class during her macro teaching practice (off-campus). The class teacher was also included in the study as she may have valuable insights into the learners and her suggestions could be beneficial for the research. The sampling methods used were Convenience and Purposive techniques. The data obtained from the tests and interviews (see APPENDIX A, B & C) were presented in the form of text and pictures, and they were analyzed using descriptive statistics such as frequencies and percentages with tables and graphs using Microsoft excel. Pupils consent for participation were sought through their parents/caretakers (see APPENDIX D).

Intervention Activities

After reviewing the relevant literature in chapter two, the researcher decided to use motivation as a means to enhance girls' involvement in mathematics lessons. There is a growing body of evidence that indicates that girls tend to have lower self-confidence in mathematics by the time they finish primary school. To promote participation and boost self-assurance, teachers should offer consistent positive feedback for girls' comments and questions. In order to motivate girls in mathematics, positive reinforcement and gender-sensitive strategies were employed.

Positive Reinforcement and Motivation

The Researcher in her attempt to improve the participation of girls in mathematics planned a mathematics lesson on

the topic, “Skip counting backward of numbers by 50s” with the whole class. The female learners were informed that any girl who answered the first three evaluation questions correctly would get three exercise books and three pens. Furthermore, any other female who answers the fourth and fifth questions correctly will get an amount of GH¢5.00 for lunch.

Female learners were advised to try their best not because of the gifts, but to enable them to climb the academic ladder. The Researcher did the above-mentioned to motivate female learners since intrinsic motivation helps than extrinsic motivation. The researcher also reinforces the female learners verbally with encouraging words like excellent, Good and you will be the best mathematician in Ghana.

Gender Sensitivity and Motivation

At Dormaa Akwamu R/C Primary, the researcher, who acted as a student-teacher, noticed that the teachers in the basic 3 class showed a preference towards male students. This aligns with Gallagher and Kaufman (2005) findings that many people believe that girls are not good at mathematics. Various experts have raised concerns about why there are gender differences in math, including psychological, biological, and social factors. To address this issue, the researcher used gender-sensitive techniques during the intervention lesson and ensured that both boys and girls received an equal opportunity to answer questions. Additionally, the researcher formed small cooperative learning groups composed of both boys and girls, with some girls serving as group leaders alongside their male counterparts. Furthermore, the researcher only called on boys to answer questions if a girl’s attempt was unsuccessful, as boys typically raise their hands to answer questions more frequently. To make the subject matter easy to understand, the Researcher employed clear, straightforward language during instruction.

Post Intervention Stage

To evaluate the efficiency of the intervention, the researcher conducted another class test on the same topic ‘Skip counting backward of numbers by 50s’. Below is the sample question for the post-test:

1. 500, 450, __, __, __
2. 300, 250, __, __, __
3. 350, 300, __, __, __
4. 450, 400, __, __, __
5. 650, 600, __, __, __

RESULTS AND DISCUSSION

Introduction

This chapter presents the results or findings. Thus, observation, interview, and intervention results are presented in the form of text and pictures. The findings are thoroughly discussed and supported with literature. Each research question is presented separately as follows.

Distribution of the characteristics of the respondents based on age and gender

The distribution ‘Table 1’ and ‘Table 2’ below describes the ages and gender of respondents in terms of frequency and percentage in the study respectively.

Table 1: Age distribution of respondents

Age	Frequency	Percentage (%)
7 – 9	10	37.0
10 – 12	15	55.6
13 – 15	2	7.4
Total	27	100

Source: Author’s Construct, 2024.

Table 1 indicates the ages of the respondents in the study. Out of the 27 respondents, 10 of them aged from 7 to 9 years which represents 37.0%. 15 of them aged from 10 to 12 years representing 55.6% and 2 of them also aged from 13 to 15 years representing 7.4%.

Table 2: Gender distribution of respondents

Gender	Frequency	Percentage (%)
Male	13	48.1
Female	14	51.9
Total	27	100

Source: Author’s Construct, 2024.

Table 2 shows the gender of the subjects in the study. Out of the 27 respondents, the male respondents were thirteen (13) representing 48.1% and the female respondents were also fourteen (14) representing 51.9%.

Research Question 1

What are the Causes of the Poor Participation of Girls in Mathematics Lesson in Basic 3 at Dormaa Akwamu R/C Primary School?

This question seeks to address the causes of poor participation of girls in mathematics of Basic 3 pupils of Dormaa Akwamu R/C Primary School. Below is a tabular description of the factors hindering the participation and performance of girls in mathematics, specifically, those at Dormaa Akwamu R/C Primary 3. These factors were extracted as causes based on the responses from the interviewees during the interview section. In all six (6) were interviewed of which five (5) were pupils and one (1) was a class teacher.

Table 3 displays the causes of the poor participation of girls in mathematics at Dormaa Akwamu R/C Basic 3. From the Table, it is viewed that, the highest frequency is three (3) which represents 50 % of the causes, and it is related to girls’ negative attitude towards the study of mathematics. The second highest frequency is two (2) which represents 33.4 % of the causes and it’s related to the socioeconomic status of students. And the lowest frequency is one (1) which represents 16.6% and it’s related to teacher’s expectations of students.

Table 3: Results from the interview on the causes of poor participation of girls in mathematics in Basic 3

Cause	Frequency	Percentage (%)
Socioeconomic status of student	2	33.4
Teachers' expectations from students	1	16.6
Girls' negative attitude towards mathematics	3	50
Total	6	100

Source: Author's Construct, 2024.

Pre-Test Result Before the Intervention (see APPENDIX B)

Before the interviews and observation were conducted, to understand the reasons why girls participate poorly in mathematics lessons at Dormaa Akwamu R/C Primary 3, a pre-test was conducted. Below is a tabular distribution indicating the pre-intervention test scores of girls before the intervention.

From Table 4, the marks allocated for the entire test was 5, the highest mark obtained was 4, and only one learner had it which constitutes 7.1%. Two girls scored 3 marks representing 14.3%, two girls scored 2 representing

Table 4: Pre-test scores of girls before the intervention

Scores	Frequency	Percentage (%)
0	5	35.7
1	4	28.6
2	2	14.3
3	2	14.3
4	1	7.1
5	0	0.0
Total	14	100

Source: Author's Construct, 2024.

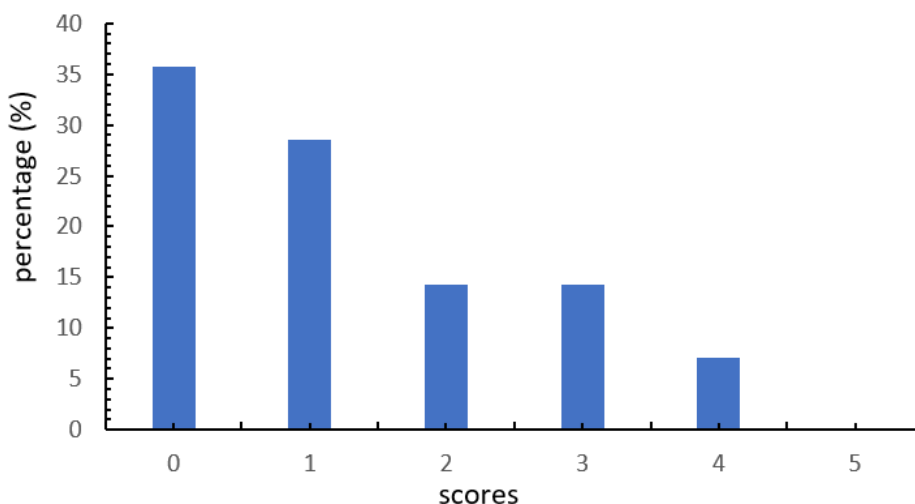


Figure 2: A bar graph of pre-test scores of girls before the intervention

14.3%, four girls scored 1 representing 28.6%, and 5 girls scored 0 representing 35.7%. Though the allocated mark for the test was 5, none of the girls had it.

Figure 2 indicates that 7.1% scored 4 marks, 14.3% scored 3 marks, 14.3% scored 2 marks, 28.6% scored 1 mark and 35.7% scored 0 marks.

From Table 5, out of the total of 5 marks, the highest mark obtained was 4, thus six boys obtained the highest mark representing 46.15%. The lowest mark obtained was 2 and three boys had that mark representing 23.08%. Four boys scored 3 representing 30.77%, and none of the boys scored 5 or below the 2 mark.

Table 5: Pre-test scores of boys before the intervention

Scores	Frequency	Percentage (%)
0	0	0.0
1	0	0.0
2	3	23.08
3	4	30.77
4	6	46.15
5	0	0.0
Total	13	100

Source: Author's Construct, 2024.

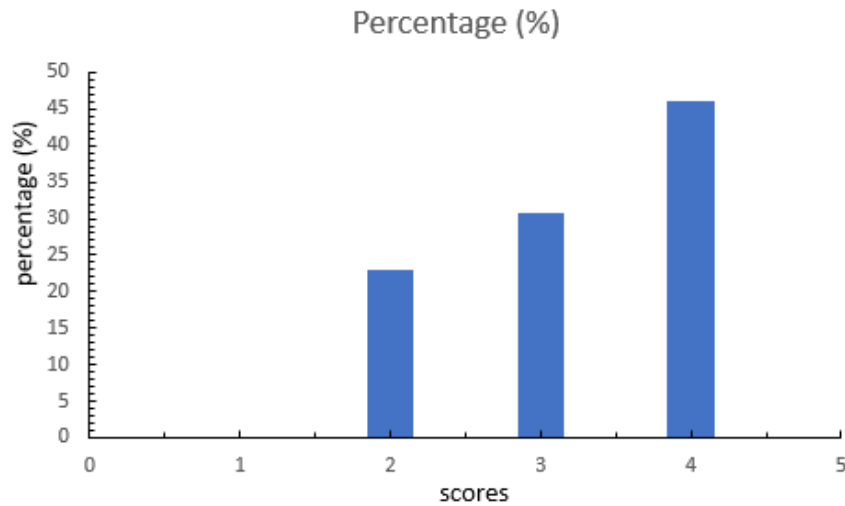


Figure 3: A bar graph of pre-test scores of boys before the Intervention

Figure 3 indicates that 46.15% scored 4 marks, 30.77% scored 3 marks, 23.08% scored 2 marks and none of the boys scored either 5 or below 2 marks.

Research Question 2

What Approaches can be Adopted to Promote the Participation of Girls in Mathematics Lessons in Basic 3 at Dormaa Akwamu R/C Primary School?

Question two aims at hammering the strategies that

could be used towards improving girls’ participation in mathematics. The distribution below indicates the strategies adopted to improve girls’ performance in mathematics based on frequency and percentage.

From Table 6, out of the six (6) participants, four (4) respondents supported positive reinforcement (motivation) which constitutes 66.7% while two (2) respondents also supported gender sensitivity which also constitutes 33.3%.

Table 6: Percentage distribution of the strategies to improve girls’ participation and performance in mathematics

Strategy	Frequency	Percentage (%)
Positive reinforcement (motivation)	4	66.7
Gender sensitivity	2	33.3
Total	6	100

Source: Author’s Construct, 2024.

Intervention Activities

To improve basic 3 girls of Dormaa Akwamu R/C Primary participation and performance in mathematics, an intervention was designed and implemented. The

intervention processes have been described in chapter three. Figure 4 shows intervention activities during the lesson.



Figure 4: Pupils undertaken intervention activities (Fieldwork, 2024)

Post-Test Result after the Intervention (see APPENDIX C)

After the intervention an activity, post-intervention test was conducted to measure the effectiveness of the intervention. Below is a tabular distribution indicating the post-intervention test scores of boys after the intervention.

Table 7: Post-test scores of boys after the intervention

Marks	Frequency	Percentage (%)
0	0	0.0
1	0	0.0
2	0	0.0
3	1	7.7
4	2	15.4
5	10	76.9
Total	13	100

Source: Author's Construct, 2024.

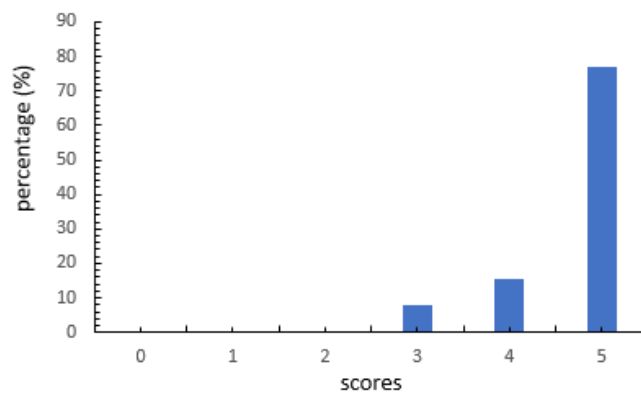


Figure 5: A bar graph of post-test scores of boys after the intervention

Table 8: Post-test scores of girls after the intervention

Marks	Frequency	Percentage (%)
0	0	0.0
1	0	0.0
2	2	14.3
3	3	21.4
4	5	35.7
5	4	28.6
Total	14	100

Source: Author's Construct, 2024.

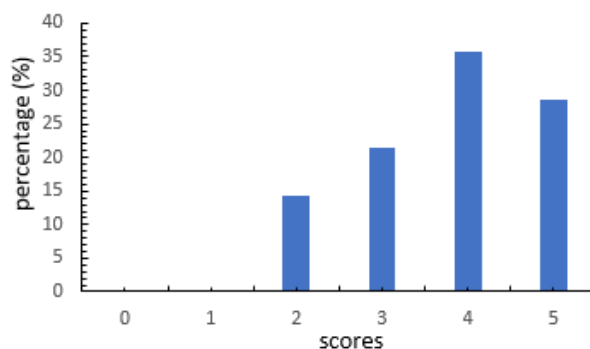


Figure 6: A bar graph of post-test scores of girls after the intervention

From Table 7, the post-intervention scores of boys were better than the pre-intervention test results. Ten boys scored the highest mark of 5 constituting 76.9%, two boys scored 4 constituting 15.4%, and one boy scored 3 also constituting 7.7%. None of the boys scored below the 3 mark.

Figure 5 indicates that 76.9% scored 5 marks, 15.4% scored 4 marks, 7.7% scored 3 marks and none of them scored below 3 marks.

In the previous test, none of the boys scored all the allocated marks, and their performance was not below 2. However, in the post-test, it was observed that ten boys were able to score all, and the lowest performance was a 3 mark. Though the intervention was meant for the girls, it also helped to improve the performance of boys in the class as shown in Figure 4. Below is a tabular distribution indicating the post-intervention test scores of girls after the intervention.

From Table 8 and Figure 6, the performance of the girls in the post-test improved tremendously. Thus, 4 girls were able to obtain the highest mark of 5 representing 28.6%, 5 girls obtained 4 marks representing 35.7%, 3 girls obtained 3 marks representing 21.4%, and 2 girls obtained 2 marks also representing 14.3%. None of the girls scored 1 mark or 2 marks in the post-intervention test.

Figure 6 indicates that 28.6% scored 5 marks, 35.7% scored 4 marks, 21.4% scored 3 marks, 14.3% scored 2 marks and none of the girls scored below 2 marks.

Comparison of the Pre-Test scores and the post-test scores

Before the implementation of the intervention measures, a test was conducted to indicate the initial performance of girls in mathematics, this test is referred to as the pre-intervention test. After a successful implementation of

the intervention measures a post-intervention test was to identify the effectiveness of the intervention measures. Below is a side-by-side comparison of the test scores of the girls in Dormaa Akwamu R/C Primary 3 from the two tests using frequency and percentage.

Table 9: Comparison of the pre-test scores and post-test scores of girls

Marks	(Pre-test) Frequency	Percentage (%)	(Post-test) Frequency	Percentage (%)
0	5	35.7	0	0.0
1	4	28.6	0	0.0
2	2	14.3	2	14.3
3	2	14.3	3	21.4
4	1	7.1	5	35.7
5	0	0.0	4	28.6
Total	14	100	14	100

Source: Author's Construct, 2024.

As indicated in Table 9 and Figure 7, the analysis shows that 35.7% (5 girls) obtained a score of zero (0) in the pre-test but none of them scored zero (0) in the post-test. 28.6% (4 girls) obtained 1 mark but nobody had 1 mark in the post-test. 14.3% (2 girls) had 2 marks in both pre-test and post-test. 14.3% (2 girls) scored 3 marks while 21.4%

(3 girls) scored 3 marks. 7.1% (1 girl) scored 4 marks in the pre-test but 35.7% (5 girls) scored impressively 4 marks. 4 girls (28.6%) in the post-test scored all of the allocated marks (5 marks) while none of them had all the marks in the post-test.

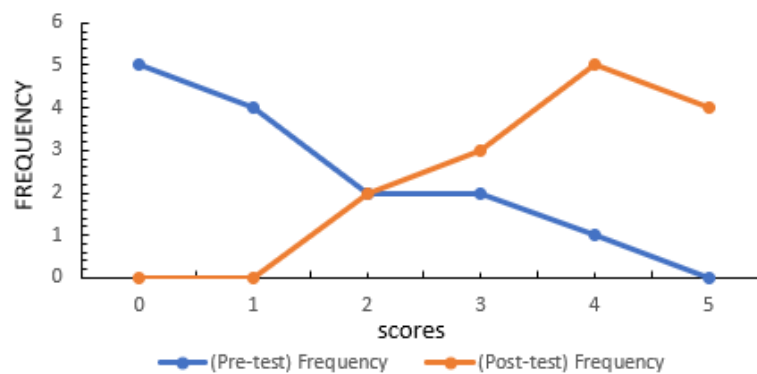


Figure 7: Line graph comparing the pre-test scores and post-test scores of girls

Findings from the Observation and Interview (see APPENDIX A)

Lesson observation revealed that whenever questions were posed in mathematics class only boys lift their hands and answer questions. While boys contribute effectively in mathematics lessons, girls' participation is always low. During an interview with five girls who scored zero in the pre-intervention test, it was observed that there is a common belief that girls are not good at mathematics. All the five girls admitted that they find mathematics difficult and hence lack interest in learning it. This belief is supported by a research finding cited by Hyde, Fennema, and Lamon (1990) that girls tend to have lower competence-related beliefs in mathematics by the end of primary school. Hence, the pre-test results in Table 5 reflect this belief.

Discussion

Based on the distribution of the ages of the respondents, the youngest students are 7 years of age while the oldest students among the respondents are 13 to 15 years. Per the basic school structure of education, a student with the age of thirteen (13) should be at the Basic 6 or 7. Unfortunately, the two respondents between 13 and 15 years are females, and their ages, however, tend to influence their performance. In Table 2, it is revealed that the difference between the males and the females is one (1). Thus, there is a sense of gender balance in Basic 3 of Dormaa Akwamu R/C Primary School. According to Table 3, around 50% of girls believe that mathematics is a difficult subject to study and is only for boys. These girls hold several negative attitudes towards mathematics that affect their interest in the subject and

subsequently their performance. Many of these girls come from low-income backgrounds where their parents are not formally educated and have less recognized occupations. Consequently, they are unable to afford the necessary learning resources and lack motivation to study at home. These factors significantly contribute to poor academic performances among such learners (Eccles, 2007). Table 3 also reveals that most teachers expect boys to perform better in mathematics and are not surprised when girls score lower marks. This attitude towards girls' capabilities in mathematics negatively impacts their interest and participation in the subject. It is crucial to discard these biased expectations and provide equal opportunities to both boys and girls in the field of mathematics.

In Table 5, it can be observed that none of the boys scored 5, but at the same time, none of them scored below 2. This indicates that the overall performance of the boys in the pre-test was quite impressive. It should be noted that some research studies have shown that there is a traditional gender gap in mathematics, which favours boys (Aunola *et al.*, 2004). The impressive performance exhibited by the boys is not unexpected. On the other hand, the girls' performance in the post-test demonstrated a significant improvement, indicating that the implementation of gender-sensitive and motivation-based approaches was highly effective. This is supported by the data presented in Figure 7. Therefore, it is recommended that the use of such approaches in mathematics instruction at the primary school level be promoted. According to Asimeng-Boahene (2007), teachers play an important role in promoting participation and self-confidence among students, particularly girls, by providing consistent positive feedback for their questions and comments. It is important for teachers to adopt effective teaching methods to help girls feel more comfortable and confident during mathematics lessons. The findings of the study reinforce the conclusion of a previous study conducted by Denteh *et al.*, (2017), which found that academic intrinsic motivation is positively correlated with a wide range of educational outcomes. The most widely supported hypothesis suggests that academic interest has a positive correlation with academic achievement. Additionally, academic intrinsic motivation is also positively correlated with engagement in classroom activities, course selection, and attitudes toward school.

Summary of Major Finding

The research has identified various factors that impede girls' participation in mathematics. Firstly, the socioeconomic status of students is determined by their parents' educational level, occupation status, and income level. The research suggests that students from low socioeconomic backgrounds may face academic challenges due to limited access to educational resources and a stressful home environment. These factors can lead to parenting disruptions or an increased likelihood of family conflicts. Secondly, most teachers hold a biased belief that boys are better at learning mathematics than

girls. Consequently, they have higher expectations for boys as compared to girls, which hinders girls' involvement and progress in math. Lastly, students, particularly girls, often display negative attitudes towards mathematics, perceiving it as a challenging subject suitable only for boys. These negative perceptions further impede girls' participation, progress, and achievement in mathematics.

Intervention Measures

After conducting interviews with six individuals, the research showed that motivating girls can help them become more engaged during mathematics lessons. The researchers urged teachers to be compassionate towards their students and avoid being harsh on them, as this can cause confusion and timidity. The researchers also emphasized the importance of providing equal opportunities to both boys and girls in mathematics classrooms and being considerate of the needs of female students. It was suggested that by adopting a gender-sensitive approach, teachers can help create a lively and productive learning environment for all students. Lastly, the researchers' intervention measures produced a highly positive outcome. Girls in the Basic Three class are now actively participating in mathematics lessons by asking and answering questions, and are also scoring better marks than the boys, as indicated in Table 8.

CONCLUSION

The findings revealed that the girls had negative attitudes towards the subject, which resulted in low participation and poor performance in mathematics lessons. Moreover, the low expectations of their teachers and the socioeconomic background of their caretakers also contributed to their lack of motivation and interest in the subject. However, the study also found that the use of motivation and gender-sensitive approaches in teaching mathematics can help improve the participation and performance of girls in the subject. Therefore, it is recommended that teachers in the early grades, basic level, and junior high school level should incorporate academic intrinsic motivation and gender-sensitive techniques in their teaching methods to help improve the performance and interest of girls in mathematics. Also, this study provides practical recommendations for mathematics teachers to encourage girls to participate in and improve their performance in mathematics. Practicing teachers should adopt gender-sensitive teaching approaches to dispel the perception that girls are not as good as boys in math. Headteachers should motivate their teachers to use effective techniques to make math more appealing to girls, ultimately helping to unlock their potential and improve their performance.

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Appendices

Appendix A

Samples of Interview Guide

Interview guide for the pupils.

1. Are your parents formally educated?
2. What work do your parents do?
3. Is mathematics a difficult subject?
4. Why do you score low marks in mathematics?
5. Do you study mathematics at home?
6. Why are you not interested in mathematics?

Interview Guide for the Teacher.

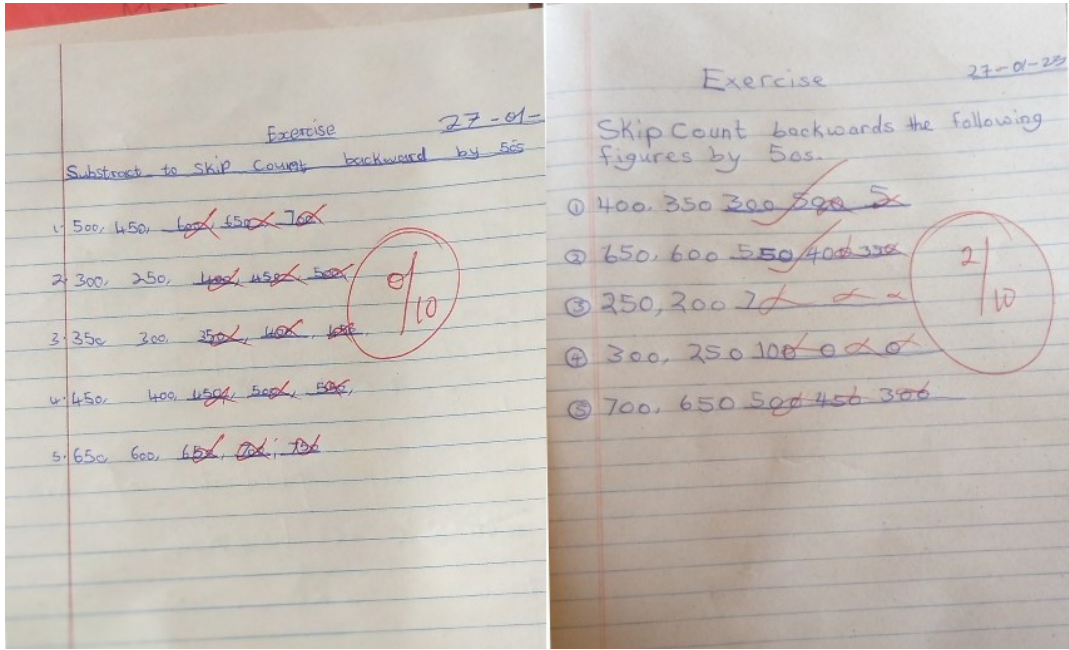
1. How much do you expect from girls as boys in the teaching and learning of mathematics?
2. Do you think girls are capable of performing equally as boys?
3. What should be done to make mathematics non-threatening to girls?
4. Do you think parents have a hand in the performances of girls in mathematics?

Appendix B

Sample of Pre-Test and Post-Test Scores

Sample of Pre-Test Scores

Duration: 30 Minutes

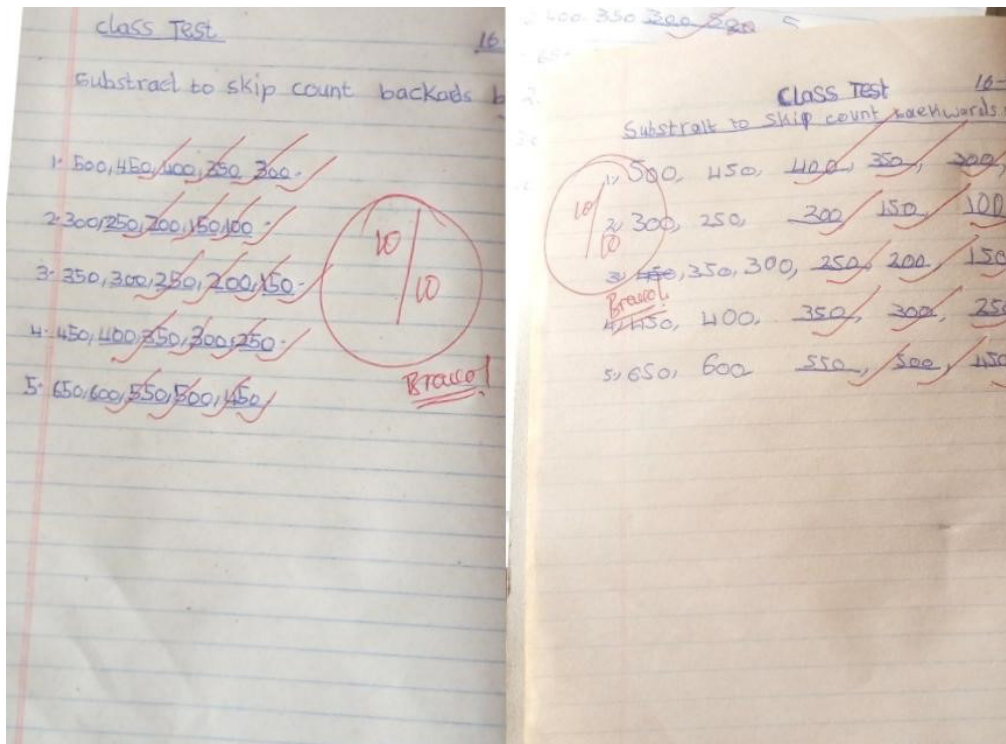


Appendix C

Sample of Pre-Test and Post-Test Scores

Sample of Post-Test Scores

Duration: 30 Minutes



Appendix D
Participants Consent Form



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November 3, 2023

Dear Sir/Madam,

PARTICIPATION CONSENT FORM

We would like to seek your consent on your child/ward participating on a study title: **IMPROVING GIRLS' PARTICIPATION IN MATHEMATICS AT DORMAA AKWAMU R/C PRIMARY THREE (3) USING MOTIVATIONAL AND GENDER – SENSITIVE APPROACHES.**

The purpose of the study is to use Motivational and Gender-Sensitive Approaches to improve Girls' Participation in Mathematics in Basic three (3) pupils of Dormaa Akwamu R/C Primary School.

The study is solely for academic purpose and your consent for your child/word to participate will be of great help to policymakers in getting to know what needs to be added to the existing policy or amend it. The information received will be treated as confidential and use for the intended purpose.

Kindly read the information below and follow the instructions.

I....., agree to participation of my child/ward in the research project titled **IMPROVING GIRLS' PARTICIPATION IN MATHEMATICS AT DORMAA AKWAMU R/C PRIMARY THREE (3) USING MOTIVATIONAL AND GENDER – SENSITIVE APPROACHES**, conducted by Patrick Akwasi Anamuah Mensah, Emmanuella Kyeremaah, Bismark Ansu, Ishmael Besing Karadaar, Joseph Gurah Junior who has (have) discussed the research project with me.

I confirm that I have received, read, and retained a copy of the letter explaining the research. I have had the chance to ask questions about the study, and I have received satisfactory responses. I understand the research's goals, risks, and methods. I give my consent for my child/ward to participate in the research, and the following points have been explained to me:

- My child/ward participation is voluntary, and he/she may withdraw from the study at any time without any consequences.
- I understand there is no risks associated with participating in the research, including the possibility of inconvenience, discomfort, or harm.
- I have been informed about whom to contact if I have any complaints about the research or its conduct.
- I am aware of the security and confidentiality of any personal information.

Consent to Publish/Use Photographs

Furthermore, I acknowledge that any information or photographs concerning my child or ward may be used in the research and/or published if applicable.

Name: _____ (please print)

Signature: _____

Date: _____