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REFLECTIVE THINKING AND SELF-EFFICACY AS CORRELATES OF STUDENTS' PERFORMANCE IN MATHEMATICS IN NORTH CENTRAL NIGERIA

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Abstract

This study investigated reflective thinking and self-efficacy as correlates of secondary schools students' performance in Mathematics in North Central, Nigeria. Four research questions guided the study, and Four hypotheses were formulated and tested at 0.05 level of significance. The study adopted a correlation survey design. The population was 269,841 senior secondary II students comprising 136,944 males and 132,897 females as of 2021/2022 academic session. A sample of 400 senior secondary II students (203 males & 197 females) was selected using multi-stage sampling procedures. The Questionnaire on Students' Reflective Thinking towards Mathematics (QSRTM), Questionnaire on Students' Self-Efficacy Towards Mathematics (QSSM) and Mathematics Performance Test (MPT) were used for data collection. The QSRTM, QSSM and MPT were developed by the researchers and validated by three experts. The reliability of QSRTM and QSSM were computed using Cronbach alpha. The results showed the reliability coefficients of 0.78 for QSRTM and 0.78 for QSSM. The reliability coefficient of MPT was calculated using Kuder-Richardson (K-21). The result indicated a reliability coefficient of 0.85. Simple regression analysis was used to analyse data to answer the research questions and Regression ANOVA was used to test the null hypotheses. The findings revealed that there is a significant relationship between male students' reflective thinking and their academic performance in Mathematics ($r = .34$, $F = 27.17$, $p = 0.00 < 0.05$). Also, there is a significant relationship between male students' self-efficacy and their academic performance in Mathematics ($r = .38$, $F = 35.45$, $p = 0.00 < 0.05$). On the other hand, it was found that there is no significant relationship between female students' reflective thinking and their academic performance in Mathematics ($r = .07$, $F = 1.12$, $p = 0.29 > 0.05$). Also, there is no significant relationship between female students' self-efficacy and their academic performance in Mathematics in North Central, Nigeria ($r = .09$, $F = 1.86$, $p = 0.17 > 0.05$). On the basis of the findings, it was recommended among other things that Mathematics teachers should endeavour to create opportunities during planning, delivering and assessment of their lessons for students to develop their reflective thinking skills and self-efficacy which may not only improve but balance students' performance in Mathematics irrespective of gender.

Key words: Reflective thinking skills, Self-efficacy, Students' performance in mathematics

Introduction

Mathematics is the branch of science that studies patterns such as in numbers, forms and their relationships. Stewart (2021), defines Mathematics as "the study of patterns and relationships that emerge from logical structures." Stewart emphasizes that Mathematics is a universal language that allows us to describe and understand the patterns found in both abstract and real-world contexts. In this view, Mathematics is not just concerned with numbers or shapes but also with the relationships that govern how systems evolve and interact. This shows that the importance of Mathematics does not only lie in its contribution to scientific and technological development but also in its utility in day-to-day interactions with all sorts of people both literate and illiterate members of the society. It is also useful in number and numeracy in order for learners to understand certain information both within and outside the school. Therefore, the competence gained in the study of Mathematics is widely used in all spheres of human life.

In Nigeria, students' performance in Mathematics at the West African Senior Secondary School Certificate Examination (WASSCE) usually conducted by the West African Examination Council (WAEC) has not been encouraging (Aligba & Garba, 2022). Students' poor performance in mathematics examinations in Nigeria is a source of worry to mathematics educators, parents, students, curriculum planners, government and non-governmental organizations, among other stakeholders in education.

Academic performance could be described as the scholastic standing of a student at a given moment. This scholastic standing involve cognitive, affective and psychomotor performance of the students. Hughes and Kramar (2023) defines academic performance in terms of both cognitive and emotional outcomes. They argue that success in academics is not only the result of intellectual abilities but also the product of a student's emotional intelligence, including their ability to manage stress, collaborate with others, and remain motivated in the face of setbacks. Katz and Lazarus (2021) defines academic performance as the student's ability to meet or exceed institutional standards for academic achievement, typically evaluated through assessments such as exams, assignments, and participation. They emphasize the importance of feedback and adaptive learning strategies, suggesting that academic performance is also influenced by a student's ability to take constructive criticism and adapt their approach to studying.

Despite extensive research on several factors influencing students' mathematics performance, the complex interaction of reflective thinking, self-efficacy, and gender in shaping their performance remains under-explored. It's a fact that most existing studies as reviewed in this study focused on individual components or specific demographic groups, neglecting the holistic impact of these factors on students' performance. This study is expected to provide understanding of the relationship between students' reflective thinking, self-efficacy and their academic performance in Mathematics and specifically, looking also from the context of gender. The findings could inform the development of targeted interventions to support students in developing reflective thinking and self-efficacy which may lead to improved students' academic performance in Mathematics.

Reflective thinking in Mathematics promotes active engagement with the learning process. According to Hatton and Smith (2023), reflective practices allow students to examine their problem-solving strategies and adjust their approach based on self-evaluation. When applied to Mathematics, reflection goes beyond the process of reaching an answer it also involves understanding why a particular solution works and how different mathematical concepts are interrelated. This deeper level of engagement fosters the development of more sophisticated problem-solving skills. Moreover, reflective thinking enhances students' ability to make

connections between abstract mathematical ideas. Recent research by Martínez, Rodríguez, and López, (2024) found that when students used reflection techniques like self-explanation or journaling, they were better able to understand complex concepts such as calculus or linear algebra. This reflects the broader findings that reflective activities lead to improved metacognitive awareness and a better understanding of the material (Brown & Hunter, 2023). Also, in a study by Duan, Zhang and Yang (2024), students who practiced reflection on their mathematical progress demonstrated increased confidence in their abilities. This sense of self-efficacy directly impacts their academic performance, as students with higher confidence tend to be more engaged and persistent in overcoming challenges in Mathematics. That is, reflective thinking is significantly related to mathematical problem-solving skills and also helps students in developing high level thinking skills by encouraging students to relate new knowledge with previous experience, the understanding of their own thinking and learning strategies. Today's education programs in most countries also prioritize development of thinking skills and emphasize that the main objective of education is development of analytical, creative, critical and reflective skills in the student. This way, they make the student active in the learning process and assign responsibility.

Reflective thinking is a systematic, rigorous, and disciplined way of thinking to make meaning out of the experience and try to relate it to the next event (Ghajargar, Wiberg & Stolterman, 2018). Reflective thinking provides opportunities for students to improve their weakness when they experience difficulties, some mistakes or some misconceptions related to their answers, they try to correct, interpret and obtain logical answers (Agustan, Juniati & Siswono, 2017). The authors posit that reflective thinking can also improve accuracy and concentration when the students solve a mathematical problem. Consequently, the students will get the right and logical answer by reflective thinking.

Reflective thinking is one of the factors that may affect students' academic performance in Mathematics. According to Ghanizadeh (2017), it has become a skill that contributes greatly to students' achievement and success. Deringol (2019) found that reflective thinking skills of students were high and female students had higher reflective thinking skills than the male counterparts. Also, there was a positive significant relationship between reflective thinking skills and their success in Mathematics performance. Recent research emphasizes the importance of an inclusive teaching approach that considers both gender and reflective thinking in the classroom. For instance, a study by Rickinson, Muneer and McGregor (2023) found that fostering an inclusive classroom environment where both boys and girls are encouraged to reflect on their learning experiences led to better mathematics outcomes for all students, with no significant gender differences in performance. This suggests that when reflective practices are embedded in the curriculum, both male and female students have an equal opportunity to succeed in mathematics, irrespective of gendered expectations. On the other hand, Alardah, AlAsheeri and Hesham (2017) found that there was a significant difference in students' reflective thinking skills due to gender; in which these differences were in favor of females. In view of this inconsistent findings this study, therefore, sought to examine whether male and female students' reflective thinking and self-efficacy correlates with their respective performances in Mathematics in the North Central zone of Nigeria.

Self-efficacy is one variable that have been associated with students'

performance. One of the leaders in self-efficacy research and theory development, Albert Bandura, described self-efficacy as people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances (Bandura, 2022). According to Mani and Mahendra (2019), individuals with strong sense of self-efficacy approach difficult tasks as challenges to be mastered rather than dangers to be avoided and have intrinsic interest in activities, set challenging goals and maintain a strong commitment to them, heighten their efforts in the face of failure, more easily recover their confidence after failures or setbacks and attribute failure to insufficient effort or different knowledge and skills which they believe they are capable of acquiring. Therefore, a student's self-efficacy is likely to affect performance in Mathematics. It should come as no surprise if there could be a positive relationship between self-efficacy and Mathematics performance of students; as performance in Mathematics improves, this could positively influence self-efficacy.

In a study to examine the relationship between self-efficacy and academic performance among university undergraduate students, Matovu (2020) found a significant relationship between self-efficacy and academic performance among university undergraduate students. Research consistently shows a positive correlation between self-efficacy and academic performance in Mathematics. For instance, a study by Pajares and Graham (2024) found that students with higher self-efficacy were more successful in standardized Mathematics tests and class assessments. This was attributed to their ability to approach tasks with confidence, use effective problem-solving strategies, and persist through challenges. In particular, self-efficacy has been found to influence students' performance in areas such as algebra, geometry, and calculus, where conceptual understanding and procedural knowledge are critical. A study by Lent, Lopez and Bieschke (2016) found that girls often exhibit lower self-efficacy in mathematics than boys, even when they perform similarly in the subject. This lower self-efficacy can result in reduced motivation, lower persistence, and a greater likelihood of giving up when faced with difficult problems. However, other studies suggest that interventions designed to improve self-efficacy in both male and female students can help bridge this gap. For instance, research by Graham and Alexander (2018) demonstrated that fostering a growth mindset and encouraging self-reflection helped female students improve their self-efficacy and mathematical performance. Also, no significant difference was obtained between male and female Self-efficacy and Mathematics achievement. It is worthy of note that most of these studies were not carried out in Nigeria. The present study, therefore, is in Nigeria and it sought to investigate the relationship between students' self-efficacy and their performance in Mathematics based on gender.

Gender difference in academic performance has been an age long debate among scholars and researchers. For a while, gender has been an issue of concern regarding academic performance. Parents and other stakeholders in the education sector often wonder if Mathematics is gender-biased. There have also been a lot of discrepancies regarding the performance of males and females in Mathematics. A lot of Studies have revealed that there are gender differences in academic performance in Mathematics. Contini, Tommaso, and Mendolia (2017) found that the gender gap increased with age and was largest among the highest achieving students. Other research findings revealed no difference in the performance of males and females' performance in Mathematics (Ajai & Imoko, 2015; Rickinson, Muneer and McGregor 2023). This shows that, there are inconsistencies in research findings on the effect of gender on students' performance in Mathematics. It is against this background that this study seeks to determine whether reflective thinking and self-efficacy correlates with students' performance in Mathematics. Also, this study ascertained

whether male and female students' reflective thinking and self-efficacy correlates with their academic performances in Mathematics in the North Central zone of Nigeria.

Research Questions

The following research questions guided the study:

1. What is the relationship between male students' reflective thinking skills and their academic performance scores in Mathematics?
2. What is the relationship between female students' reflective thinking skills and their academic performance scores in Mathematics?
3. What is the relationship between male students' self-efficacy and their academic performance scores in Mathematics?
4. What is the relationship between female students' self-efficacy and their academic performance scores in Mathematics?

Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance:

Ho_1. There is no significant relationship between male students' reflective thinking and their academic performance scores in Mathematics.

Ho_2. There is no significant relationship between female students' reflective thinking and their academic performance scores in Mathematics.

Ho_3. There is no significant relationship between male students' self-efficacy and their academic performance scores in Mathematics.

Ho_4. There is no significant relationship between female students' self-efficacy and their academic performance scores in Mathematics.

Methodology

The design for this study was a correlation survey design. The choice of this design is because this study sought to determine the relationship between students' reflective thinking, self-efficacy and their performance in Mathematics without any attempts by the researchers to control or manipulate the variables.

The study was conducted in North Central Zone. North Central Zone is one of the six geopolitical zones that make up Nigeria. It is also called the middle belt. The zone consists of six states (Benue, Kogi, Kwara, Nasarawa, Niger and Plateau) as well as the Federal Capital Territory, Abuja.

The target population for this study was 269,841 senior secondary II students comprising 136,944 males and 132,897 females in the 1,942 public secondary schools in North Central Geopolitical Zone of Nigeria as at the 2021/2022 academic session. Using the Taro-Yamane sample size table, the sample size of the study consisted of 400 comprising 203 males and 197 females (at precision level of 0.05 alpha and 95% confidence level) senior secondary school II students selected from 63 (out of the 1,942 public secondary schools in North Central Zone of Nigeria).

Multi-stage sampling procedure was adopted for the study. Stage one, simple random sampling technique was used to select two states and the Federal Capital Territory, Abuja. That is, the names of 6 states and Abuja were written on piece of papers and squeezed before putting them in a container after which two (Benue and Nasarawa) states and the Federal Capital Territory, Abuja were picked using simple random sampling without replacement. Stage two, purposive sampling technique was used to select 63 public co-educational senior secondary schools to take care of the moderator variable (gender) from the two states and Federal Capital Territory. Stage three, proportionate random sampling technique was used to select male and

female students, and schools to ensure that the sample from each state and Federal Capital Territory is proportionate to its number of schools and population from the sampled schools.

Three research instruments were used to collect data for this study. They are Questionnaire on Students' Reflective Thinking towards Mathematics (QSRTM), Questionnaire on Students' Self-efficacy Towards Mathematics (QSSM), and Mathematics Performance Test (MPT) to determine their performances in the subject. The QSRT, QSSM and MPT were developed by the researchers.

Senior secondary II Mathematics teachers were used as research assistants. The researchers explained the purpose of the study and process of administering the instruments to the research assistants on the first day before the QSRTM, QSSM and MPT were administered to the students in their schools respectively.

Simple linear regression analysis was used to analysed data to answer the research questions and Regression ANOVA was used to analyse data to test the null hypotheses at 0.05 level of significance. The statistics used were deemed suitable because it shows the relationship between an outcome and predicator variables as well as the importance of each of the predictors, often with the effect of other predictors statistically eliminated.

Results

Research Question One

What is the relationship between male students' reflective thinking skills and their academic performance scores in Mathematics?

Table 1: *Regression Analysis of Relationship between Male Students' Reflective Thinking Skills and their Performance in Mathematics*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.345[a]	.119	.115	6.64603

a. Predictors: (Constant), Male students' reflective thinking skills in Mathematics

Summary data in Table 1 shows the relationship between male students' reflective thinking skills and their performance in Mathematics. The analysis shows that the correlation between male students' reflective thinking skills and their performance in Mathematics is 0.35 with a coefficient of determination of 0.119. This implies that 11.9 percent of male students' performance in Mathematics is as a result of their reflective thinking skills. The analysis further shows a low positive linear relationship between male students' reflective thinking skills and their performance in Mathematics. Thus, the relationship between male students' reflective thinking skills and their performance in Mathematics is 0.35.

Research Question Two

What is the relationship between female students' reflective thinking skills and their academic performance scores in Mathematics?

Table 2: *Regression Analysis of Relationship between Female Students' Reflective Thinking Skills and their Performance in Mathematics*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.076[a]	.006	.001	8.17063

a. Predictors: (Constant), Female students' reflective thinking skills in Mathematics

Summary data in Table 2 shows the relationship between female students' reflective thinking skills and their performance in Mathematics. The analysis shows that the correlation between female students' reflective thinking skills and their

performance in Mathematics is 0.08 with a coefficient of determination of 0.006. This implies that 0.6 percent of female students' performance in Mathematics is due to their reflective thinking skills. The analysis further shows a very low positive linear relationship between female students' reflective thinking skills and their performance in Mathematics. Thus, the relationship between female students' reflective thinking skills and their performance in Mathematics is 0.08.

Research Question Three

What is the relationship between male students' self-efficacy and their academic performance scores in Mathematics?

Table 3: *Regression Analysis of Relationship between Male Students' Self-efficacy and their Performance in Mathematics*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.387[a]	.150	.146	6.52857

a. Predictors: (Constant), Male students' self-efficacy in Mathematics

Results of Analysis in Table 3 shows the relationship between male students' Self-efficacy and their performance in Mathematics. The analysis shows that the correlation between male students' Self-efficacy and their performance in Mathematics is 0.39 with a coefficient of determination of 0.150. This implies that 15.0 percent of male students' performance in Mathematics can be attributed to their Self-efficacy. The analysis further shows a low positive linear relationship between male students' Self-efficacy and their performance in Mathematics. Thus, the relationship between male students' Self-efficacy and their performance in Mathematics is 0.39.

Research Question Four

What is the relationship between female students' self-efficacy and their academic performance scores in Mathematics?

Table 4: *Regression Analysis of Relationship between Female Students' Self-efficacy and their Performance in Mathematics*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.097[a]	.009	.004	8.15526

a. Predictors: (Constant), Female students' self-efficacy in Mathematics

Results of Analysis in Table 4 shows the relationship between female students' Self-efficacy and their performance in Mathematics. The analysis shows that the correlation between female students' self-efficacy and their performance in Mathematics is 0.10 with a coefficient of determination of 0.009. This implies that 0.9 percent of female students' performance in Mathematics can be attributed to their self-efficacy. The analysis further shows a very low positive linear relationship between female students' self-efficacy and their performance in Mathematics. Thus, the relationship between female students' self-efficacy and their performance in Mathematics is 0.10.

Hypothesis One

There is no significant relationship between male students' reflective thinking and their academic performance scores in Mathematics.

Table 5: *Regression ANOVA of Male Students' Reflective Thinking and their Performance in Mathematics*

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1200.153	1	1200.153	27.171	.000[b]
	Residual	8878.107	201	44.170		
	Total	10078.260	202			

b. Predictors: (Constant), Male students' reflective thinking skills in Mathematics

Results of Analysis in Table 5 reveal that $F(1,201) = 27.171$; $p = 0.000 < 0.05$. Thus, the null hypothesis is rejected. This implies that there is a significant relationship between male students' reflective thinking and their performance in Mathematics. Thus, based on evidence from data analysis, there is a significant relationship between male students' reflective thinking and their academic performance scores in Mathematics.

Hypothesis Two

There is no significant relationship between female students' reflective thinking and their academic performance scores in Mathematics.

Table 6: *Regression ANOVA of Female Students' Reflective Thinking and their Performance in Mathematics*

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	75.280	1	75.280	1.128	.290[b]
	Residual	13018.032	195	66.759		
	Total	13093.312	196			

b. Predictors: (Constant), Female students' reflective thinking skills in Mathematics

Summary data in Table 6 reveals that $F(1,195) = 1.128$; $p = 0.290 > 0.05$. Thus, the null hypothesis is not rejected. This implies that there is no significant relationship between female students' reflective thinking and their performance in Mathematics. Thus, based on evidence from data analysis, there is no significant relationship between female students' reflective thinking and their academic performance scores in Mathematics.

Hypothesis Three

There is no significant relationship between male students' self-efficacy and their academic performance scores in Mathematics.

Table 7: *Regression ANOVA of Male Students' Self-efficacy and their Performance in Mathematics*

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1511.193	1	1511.193	35.456	.000[b]
	Residual	8567.067	201	42.622		
	Total	10078.260	202			

b. Predictors: (Constant), Male students' self-efficacy in Mathematics

Results of Analysis in Table 7 reveals that $F(1,201) = 35.456$; $p = 0.000 < 0.05$. Thus, the null hypothesis is rejected. This implies that there is significant relationship between male students' self-efficacy and their performance in

Mathematics. Thus, based on evidence from data analysis, there is a significant relationship between male students' self-efficacy and their academic performance scores in Mathematics.

Hypothesis Four

There is no significant relationship between female students' self-efficacy and their academic performance scores in Mathematics.

Table 8: *Regression ANOVA of Female Students' Self-efficacy and their Performance in Mathematics*

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	124.193	1	124.193	1.867	.173[b]
	Residual	12969.120	195	66.508		
	Total	13093.312	196			

b. Predictors: (Constant), Female students' self-efficacy in Mathematics

Summary data in Table 8 reveals that $F(1,195) = 1.867$; $p = 0.173 > 0.05$. Thus, the null hypothesis is not rejected. This implies that there is no significant relationship between female students' self-efficacy and their performance in Mathematics. Thus, based on evidence from data analysis, there is no significant relationship between female students' self-efficacy and their academic performance scores in Mathematics

Discussion of Findings

The findings of the study are discussed based on the four research questions and the corresponding hypotheses that guided the study. Finding revealed that there is significant relationship between male students' reflective thinking and their academic performance in Mathematics in North Central, Nigeria. This means that male students' reflective thinking is a determinant of their performance in Mathematics. The study found a low positive linear relationship between male students' reflective thinking skills and their performance in Mathematics. The finding disagrees with Deringol (2019) that reflective skills of students were high and female students had higher reflective skills than the male counterparts. The finding also disagreed with Rickinson, Muneer and McGregor (2023) who found that fostering an inclusive classroom environment where both boys and girls are encouraged to reflect on their learning experiences led to better mathematics outcomes for all students, with no significant gender differences in performance. This suggests that when reflective practices are embedded in the curriculum, both male and female students have an equal opportunity to succeed in mathematics, irrespective of gendered expectations.

The finding of the present study shows that, reflective thinking is a part of male students' self-regulation which involves active selection in thinking activities in doing complex tasks, whereby male students can evaluate themselves in carrying out a task. The emphasis is that reflective thinking is a systematic, rigorous, and disciplined way of thinking to make meaning out of the experience and try to relate it to the next event. Reflective thinking encourages male students to develop strategies to solve problems by exploring their experience in new and more complex knowledge. This may be responsible for the significant relationship found between male students' reflective thinking and their performance in Mathematics in North Central, Nigeria.

Finding revealed that there is no significant relationship between female students' reflective thinking and their academic performance in Mathematics in

North Central, Nigeria. This denotes that female students' reflective thinking is not a determinant of their performance in Mathematics in North Central, Nigeria. The study found a very low positive linear relationship between female students' reflective thinking skills and their performance in Mathematics in North Central, Nigeria. The finding disagrees with Brown and Hunter, (2023) who found that reflective activities lead to improved metacognitive awareness and a better understanding of the material. Also, the finding disagrees with Duan, Zhang and Yang (2024) who found that students who practiced reflection on their mathematical progress demonstrated increased confidence in their abilities while Alardah, AlAsheeri and Hesham (2017) found that there was significant difference in students' reflective thinking skills due to the variables: gender; in which these differences were in favor of females.

Reflective thinking ability of female students showed none of these kinds of actions that is realizing what has been known before; applying available knowledge without in-depth evaluation; process of internal evaluation and exploration of problems by connecting with related experience; and the awareness of the reasons behind the actions taken. This may be responsible for the no significant relationship found between female students' reflective thinking and their performance in Mathematics in North Central, Nigeria.

Finding revealed that there is a significant relationship between male students' self-efficacy and their academic performance in Mathematics in North Central, Nigeria. This indicates that male students' self-efficacy is a determinant of their performance in Mathematics in North Central, Nigeria. Though, the study found a low positive linear relationship between male students' Self-efficacy and their performance in Mathematics in North Central, Nigeria, the finding agrees with Matovu (2020) that there were differences noted as regards gender in the students' academic self-efficacy and academic performance. Also, Mani and Mahendra (2019), found that individuals with strong sense of self-efficacy approach difficult tasks as challenges to be mastered rather than dangers to be avoided and have intrinsic interest in activities, set challenging goals and maintain a strong commitment to them, heighten their efforts in the face of failure, more easily recover their confidence after failures or setbacks and attribute failure to insufficient effort or different knowledge and skills which they believe they are capable of acquiring as is common among males. Male students' strong self-efficacy beliefs enhance their wellbeing and academic performance. This may be responsible for the significant relationship found between male students' self-efficacy and their performance in Mathematics in North Central, Nigeria.

Finding revealed that there is no significant relationship between female students' self-efficacy and their academic performance in Mathematics in North Central, Nigeria. This implies that female students' self-efficacy is not a determinant of their performance in Mathematics. Though the study found a very low positive linear relationship between female students' self-efficacy and their performance in Mathematics it was not significant. The finding agrees with Lent, Lopez and Bieschke (2016) who found that girls often exhibit lower self-efficacy in mathematics than boys, even when they perform similarly in the subject. This lower self-efficacy can result in reduced motivation, lower persistence, and a greater likelihood of giving up when faced with difficult problems. However, the finding disagrees with Graham and Alexander (2018) whose interventions study was designed to improve self-efficacy in both male and female students to help bridge the gap by fostering a growth mindset and encouraging self-reflection to help both male and female students improve their self-efficacy and mathematical performance. Also, the finding disagrees with Pajares and Graham (2024) who found that students with higher self-efficacy were more successful in

standardized Mathematics tests and class assessments irrespective of their gender.

Academic performance of female students is not influenced by their sense of talents within a certain domain as a general concept. The most effective way to develop a sense of self-efficacy is via mastery experiences. These are in reality, recollections of prior successful experiences that female students may recall when confronted with current or future challenges. Positive reinforcement in mathematics class may raise female students' self-efficacy. This may be responsible for the no significant relationship found between female students' self-efficacy and their performance in Mathematics in North Central, Nigeria.

Conclusion

The study concluded that there is a significant relationship between male students' reflective thinking and their academic performance in Mathematics. Also, there is a significant relationship between male students' self-efficacy and their academic performance in Mathematics. However, it was found that, there is no significant relationship between female students' reflective thinking and their academic performance in Mathematics. Also, there is no significant relationship between female students' self-efficacy and their academic performance in Mathematics

Recommendations

Based on the findings of the study, the following recommendations were made:

1. Mathematics teachers should endeavour to create opportunities during planning, delivering and assessment of their lessons for students to develop their reflective thinking skills and self-efficacy to improve students' performance in Mathematics.
2. Teacher training institutions like colleges of education and faculties of education of universities should train pre-service teachers on how to determine learners' reflective thinking skills and self-efficacy. They should also train pre-service teachers on how to create activities and exercises that will improve students' reflective thinking skills and self-efficacy.
3. The States and Federal Ministries of Education should formulate policies on Mathematics teaching and learning to increase the level of understanding of the relationship among students' reflective thinking, self-efficacy and their performance in Mathematics. This may enable them to make policies that are appropriate to the teaching and learning of Mathematics.
4. The Mathematics Teachers' Association of Nigeria (MTAN), the States and Federal Ministries of Education, States Universal Basic Education Board (SUBEB), the Teaching Services Board (TSB) should organise seminars to educate teachers on how reflective thinking and self-efficacy relate to students' performance in Mathematics. This may help teachers to adopt appropriate teaching strategies that will improve students' reflective thinking and self-efficacy.

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