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Self-Efficacy of Pupils' Academic Achievement in Mathematics

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ABSTRACT

The study examined the self-efficacy of pupils' academic achievement in mathematics. The study adopted a correlational research design. A simple random sampling technique was used to select 568 pupils from 14 public primary schools in the research locale. Two research instruments were used for data gathering. The instruments were the Questionnaire on Pupils' Self-efficacy (QFYPS) and Mathematics Achievement Test (MAT). One research question was raised while two hypotheses were postulated. QFYPS and MAT were validated by lecturers in the Department of Early Childhood and Primary Education, Kwara State University, Malete, Nigeria. QFYPS and MAT were also tested for reliability using the test-retest method and the reliability coefficients were 0.79 and 0.77 respectively. The research question was answered using Pearson Product Moment Correlation (PPMC) while the two hypotheses were tested using Independent samples t-test. The findings of the study showed that there was a positive relationship between pupils' self-efficacy and their academic achievement in mathematics. Also, there was no significant difference in the self-efficacy of pupils based on gender. Finally, there was no significant difference in the academic achievement of pupils based on gender. Based on the findings of the study, it was recommended that Teachers and policymakers should implement strategies that enhance pupils' self-efficacy beliefs in mathematics.

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1. INTRODUCTION

In Nigeria, Mathematics is compulsory at both the primary and secondary school levels, and it is also a prerequisite for various degree programs such as education, medicine, accounting, architecture, and engineering (Jameel & Ali, 2016). Mathematics serves as a valuable tool for understanding different subjects and languages. It provides the foundation for numerous scientific disciplines and is a fundamental aspect of human reasoning and logic, playing a vital role in our efforts to comprehend the world and ourselves.

According to Fraser *et al*. (2020), Mathematics is a field of study that focuses on structure, order, and relationships originating from the basic activities of counting, measuring, and describing object shapes. It involves logical thinking and quantitative calculations, and over time, its subject matter has become increasingly idealized and abstracted. Since the 17th century, Mathematics has been crucial in the physical sciences and technology, and more recently, it has assumed a comparable role in the quantitative aspects of biological sciences.

Technology plays a crucial role in the advancement of society, and Mathematics serves as the underlying foundation for both technology and science. Hence, the utilization of Mathematics and/or technology is indispensable across all professional domains, as automation has become prevalent. Moreover, Mathematics cultivates computational skills in students, which are essential for problem-solving in everyday life. Additionally, Mathematics is considered a fundamental subject for pursuing higher education in nearly all fields of study within tertiary institutions.

The economies of many developed nations heavily rely on science and technology. Nigeria's ambition to be among the top 20 global economies reflects its recognition of the importance of science, technology, and vocational education (Federal Republic Nigeria, 2014). Mathematical approaches are widely employed across various human endeavors, making mathematics education pivotal to a country's economic prosperity. Therefore, Nigeria emphasizes the need for learners to exhibit strong mathematical proficiency at all educational levels, enabling scientific and technological advancement.

Despite the importance of mathematics in the Nigerian educational system and national development, the academic performance of learners in Mathematics at national examinations has been lackluster (Abubakar & Uboh, 2010; Makondo & Makondo, 2020). The results of external examinations have been unimpressive, specifically in the Ilorin West Local Government Area of Kwara State in 2019. Out of the 13,062 pupils who registered for the Kwara State Common entrance examination in the local government area, only 4,781 (36.6%) had 50 marks or higher in Mathematics, while 8,281 (63.4%) had less than 50 marks. Godswill Obioma, former Registrar and Chief Executive of the National Examinations Council (NECO) expressed his concerns about the matter, reporting that only 34.6 percent (24,416) of the 70,580 candidates nationwide passed all the examinable subjects, including Mathematics.

This poor situation should not be allowed to continue if academic success in mathematics must be attained. Academic success and obtaining good grades are among the main goals in all levels of education while having positive outcomes both for the learners and educational systems. Therefore, identifying the factors influencing students' academic success has ever been one of the most important concerns of us and educational psychologists (Mega *et al*., 2014). One of the factors influencing learners' academic performance is self-efficacy. Self-efficacy refers to the student's beliefs and attitudes toward their capabilities to achieve academic success, as well as their belief in their ability to fulfill academic tasks and the successful learning of the materials.

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Self-efficacy beliefs lead to individuals' excellent performance through increasing commitment, endeavor, and perseverance (Pintrich, 2002). The learners with high levels of self-efficacy attribute their failures to lower attempts rather than lower ability, while those with low self-efficacy attribute their failures to their low abilities (Kurbanoglu & Akim, 2010). Therefore, self-efficacy can influence the choice of tasks and perseverance while doing them. In other words, students with low self-efficacy are more likely to be afraid of doing their tasks, avoiding, postponing, and giving them up soon. In contrast, those with high levels of self-efficacy are more likely to rely on themselves when faced with complex issues to find a solution to the problem, as well as being patient during the process, making more efforts, and persisting longer to overcome the challenges.

Many studies (Kurbanoglu & Akim, 2010, Artino & Stephens, 2020; Klassen *et al*., 2021) have been carried out on self-efficacy but none of these studies examined the relationship between self-efficacy and pupils' academic performance in mathematics at the primary school and the results of these studies cannot be generalized to the pupils at the primary school level, particularly in Ilorin West Local Government Area of Kwara State and this is the research gap the study intended to fill.

Gender is a variable of interest in this study. The concept of gender encompasses the unique characteristics attributed to males and females, including various social, economic, cultural, and political aspects and opportunities associated with being a man or a woman. The definitions of masculinity and femininity vary across cultures and evolve. Gender refers to the attributes associated with being male or female. It represents the distinct features and roles specific to particular groups of individuals concerning their sexuality and sex (Obafemi, 2021). Some scholars have argued that males possess a superiority complex over females. Several studies have been conducted to examine the effect of gender on learners' academic performance (Awodun & Oyeniyi, 2018; Albalawi, 2019), but the findings have not been consistent. Therefore, in this study, gender is considered a moderator variable.

Mathematics holds significant importance in Nigeria's education system and national development, as it is a mandatory subject at primary and secondary levels and a prerequisite for various degree programs. It serves as a valuable tool for understanding different subjects, lays the foundation for scientific disciplines, and plays a crucial role in human reasoning and logic. Mathematics is also fundamental for technology and science, with its application being essential in every field of work. However, despite its importance, learners' academic performance in mathematics has been disappointing, as reflected in national examination results. Self-efficacy has been identified as influential in academic success. Nevertheless, there was a research gap in examining the relationship between self-efficacy and pupils' academic performance in mathematics at the primary school level, particularly in the Ilorin West Local Government Area of Kwara State, which this study aimed to address

The research question what is the relationship between self-efficacy and pupils' academic achievement in mathematics?

Hypotheses are the following:

(i) $H0_1$: There is no significant difference in the self-efficacy of final-year pupils based on gender.

(ii) $H0_2$: There is no significant difference in pupils' academic achievement in mathematics based on gender.

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2. METHODS

The study adopted a correlational research design. All the pupils in public primary schools in Ilorin West Local Government Area of Kwara State constituted the population of the study. A simple random sampling technique was used to select 568 pupils from 14 public schools in the research locale. Two research instruments were used for data gathering. The instruments were the Questionnaire on Pupils' Self-efficacy (QFYPS) and Mathematics Achievement Test (MAT). QFYPS had 10 items with three Likert scales of Agree (A), Neither Agree nor Disagree (NAD), and Disagree (D) while MAT contained 50 multiple-choice questions with four options (A, B, C, and D). Both QFYPS and MAT were validated by lecturers in the Department of Early Childhood and Primary Education, Kwara State University, Malete, Nigeria. QFYPS and MAT were also tested for reliability using the test-retest method and the reliability coefficients were 0.79 and 0.77 respectively. Six trained research assistants were engaged in the study and the study lasted for six weeks. The research questions were answered using frequency count, percentage, mean, and Pearson Product Moment Correlation (PPMC) while hypotheses were tested using Independent samples t-test. The hypotheses were tested at a 0.05 level of significance.

3. RESULTS AND DISCUSSION

3.1. Research Question One: What is the relationship between self-efficacy and pupils' academic achievement in mathematics?

Table 1 shows the relationship between self-efficacy and pupils' academic achievement in mathematics. It was revealed that there was a positive relationship between pupils' self-efficacy and their academic achievement in mathematics (r = .509; n = 568).

Table 1. Table showing the relationship between self-efficacy and pupils' academic achievement in mathematics.

Variables		Self-efficacy	Performance
Self-efficacy	Pearson Correlation	1	0.509
	Sig. (2-tailed)		0.000
	N	568	568
Performance	Pearson Correlation	0.509	1
	Sig. (2-tailed)	0.000	
	N	568	568

3.2. Research Hypothesis One: There is no significant difference in the self-efficacy of final-year pupils based on gender in Ilorin West Local Government Area of Kwara State

Table 2 showed that there was no significant difference in the self-efficacy of pupils based on gender (t = 0.913, df = 566, p > 0.05). The hypothesis is therefore not rejected in the light of the result since the significant level is greater than 0.05. This implies that gender had no significant influence on the self-efficacy of final-year pupils in Ilorin West Local Government Area of Kwara State.

Research Hypothesis Two: There is no significant difference in pupils' academic achievement in mathematics based on gender.

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Table 2. Summary of t-test analysis showing the difference in the self-efficacy of final-year pupils based on gender.

Gender	n	Mean	Std. Deviation	t	df	Sig	Remark
Male	270	19.04	6.57				
				-.109	566	0.913	Not Significant
Female	298	19.10	6.55				

Table 3 shows that there was no significant difference in pupils' academic achievement in mathematics based on gender (t = -.189; df = 566, p > 0.05). The hypothesis is therefore not rejected in the light of the result since the significant level is greater than 0.05. This implies that gender had no significant influence on pupils' academic achievement in mathematics in Ilorin West Local Government Area of Kwara State.

Table 3. Summary of t-test analysis showing the difference in pupils' academic achievement in mathematics based on gender.

Gender	n	Mean	Std. Deviation	t	df	Sig	Remark
Male	270	59.40	14.35				
				-.189	566	0.850	Not Significant
Female	298	59.62	14.34				

3.3. Discussion

The finding of the study revealed that there was a positive relationship between pupils' self-efficacy and their academic achievement in mathematics. This finding was in tandem with the research study of Pajares and Miller (1994) which revealed that students with higher self-efficacy in mathematics tended to perform better academically in that subject. This finding suggests that when students have a strong belief in their capabilities to succeed in mathematics, they are more likely to engage in effective learning strategies and persist in the face of challenges. Similarly, Lent *et al*. (2000) revealed a positive correlation between self-efficacy beliefs in mathematics and actual performance. Students who had higher self-efficacy in mathematics achieved higher grades in the subject compared to those with lower self-efficacy. Furthermore, Bandura's social cognitive theory provides a theoretical framework to support the positive relationship between self-efficacy and academic achievement (1997). However, it is important to note that not all studies have consistently found a positive relationship between self-efficacy and academic achievement in mathematics. For example, a study by Multon *et al*. (1991) found that the relationship between self-efficacy in mathematics and performance was weaker and less consistent.

Furthermore, findings reported that there was no significant difference in the self-efficacy of pupils based on gender. This finding aligned with the research of Betz and Hackett (1981) found that gender did not significantly predict self-efficacy beliefs among individuals. This suggests that gender may not be a reliable predictor of self-efficacy in specific domains. Caprara *et al*. (2006) revealed that gender did not exert a significant influence on self-efficacy across various domains, including academic performance. Furthermore, a meta-analysis conducted by Judge *et al*. (2010) revealed that gender does not significantly moderate the relationship between self-efficacy and performance. In contrast, some studies have reported small gender differences in self-efficacy. For example, a study by Fennema and Sherman (1977) found that males tended to have higher self-efficacy beliefs in mathematics compared to females.

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In addition, findings revealed that there was no significant difference in pupils' academic achievement in mathematics based on gender. The finding was in agreement with the meta-analysis by Else-Quest *et al*. (2010) which reviewed data from 242 studies involving over 1.3 million students and concluded that there was no significant difference in male and female academic performance across different countries or cultures. Similarly, Obafemi *et al*. (2023) discovered that there was no significant effect of gender on pupils' academic achievement in mathematics. On the contrary, Reilly and Neumann (2013) researched and found that males tended to outperform females in mathematics and science, while females performed better in language-based subjects.

4. CONCLUSION

Based on the findings of the study, it concluded that there was a positive relationship between pupils' self-efficacy and their academic achievement in mathematics. Gender had no significant influence on pupils' self-efficacy and academic achievement in mathematics. Based on the findings, the following recommendations were made:

(i) Teachers and policymakers should implement strategies that enhance students' self-efficacy beliefs in mathematics.
(ii) Teachers should maintain an inclusive environment that supports all pupils regardless of their gender.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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