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EFFECT OF SELF-REGULATED LEARNING ON ACHIEVEMENT AND GOAL ORIENTATION OF SENIOR SECONDARY SCHOOL MATHEMATICS STUDENTS IN LAGOS STATE

BY

Hakeem Owolabi Showunmi: Department of Science and Mathematics, Federal College of Education (Technical) Secondary School, Akoka, Lagos, Nigeria; E-mail: hakeemowolabi43@gmail.com

&

Prof. O. M. Alade: Department of Educational Foundations, Faculty of Education, University of Lagos, Akoka, Nigeria

Abstract

This study explored the effect of self-regulated learning on achievement and goal orientation of senior secondary school mathematics students in Lagos State. Four research questions and four null hypotheses guided the study. The study employed quasi-experimental design. The sample size used in this study was 60 students, comprising of 30 participants in the experimental group and 30 participants in the control group. These participants were chosen from two randomly selected senior secondary schools in the chosen local government area. The research instruments used for collection of data in this study were Mathematics Achievement Test (MAT) and Motivation Scale on Goal Orientation (MSGO). Data collected were analysed using independent t-test at 0.05 level of significance. The study found among others that mathematics achievement means scores differed significantly between students exposed to self-regulated learning and control group; and significant difference exists in goal orientation of Mathematics students exposed to self-regulated learning and control group. The study concluded that self-regulated learning has significant effect on the achievement and goal orientation of senior secondary school mathematics students in Lagos State. The study recommended among others that Mathematics teachers should teach students self-regulated learning strategies such as goal setting, time management, and self-monitoring; and secondary school administrators should organise workshops and seminars for Mathematics students on effective study skills and self-regulated learning.

Keywords: Achievement, Goal Orientation, Mathematics, Self-Regulated Learning and Senior Secondary Schools

Introduction

Mathematics occupies a vital position in the educational system of every nation. It is a subject regarded as a foundational discipline for careers in engineering, medicine, economics, computer science, and other science-related professions. It contributes significantly to technological innovation, scientific advancement, and economic development. In Nigeria, mathematics is a compulsory subject offered at both primary and secondary school levels. It is a prerequisite for admission into most programmes in Nigerian tertiary institutions. Despite its recognised importance, students' achievement in mathematics in Nigerian secondary schools has remained unsatisfactory over the years, particularly in external examinations such as the West African Senior School Certificate Examination (WASSCE) and National Examination Council (NECO) examinations (WAEC, 2023).

The poor achievement of students in mathematics has generated concern among researchers, educators, policymakers, and parents. Factors responsible for students' poor performance in mathematics include inadequate instructional materials, poor study habits, ineffective teaching methods, poor classroom environment, mathematics anxiety, low motivation and lack of learner autonomy (Salman, Mohammed, & Ogunlade, 2020; Usman & Nwoye, 2021). In recent years, educational researchers have shifted attention from teacher-related factors to learner-related factors that influence academic achievement. One of such learner-related variables is self-regulated learning. Self-regulated learning is an important concept in educational psychology as it emphasises students' active involvement in controlling and directing their own learning processes. According to Panadero (2017), self-regulated learning refers to learners' ability to plan, monitor, regulate, and evaluate their cognition, motivation, behaviour, and learning environment in order to achieve academic goals. Self-regulated learning involves three major phases: forethought, performance, and self-reflection. During the forethought phase, learners analyse tasks, set goals, and select appropriate strategies.

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During the performance phase, learners monitor their understanding and regulate their behaviours. In the self-reflection phase, learners evaluate their performance and make adjustments for future learning activities (Schunk & Greene, 2018).

In addition, self-regulated learning involves several processes such as goal setting, strategic planning, self-monitoring, time management, self-reflection, self-evaluation, and help-seeking behaviours (Schunk & Greene, 2018). Students who possess these skills are usually more motivated, disciplined, and academically successful because they take responsibility for their learning outcomes. Such students are capable of identifying their strengths and weaknesses, adopting suitable learning strategies, and making necessary adjustments during learning activities. Studies have shown that a large proportion of secondary school students perceive mathematics as difficult, abstract, and anxiety-inducing, thereby affecting their performance negatively (Awofala, 2017; Tambunan, 2019). Therefore, the importance of self-regulated learning in enhancing students' mathematics achievement cannot be underestimated. Mathematics requires logical reasoning, persistence, concentration, continuous practice, and problem-solving abilities. Thus, students who are capable of regulating their learning processes effectively are more likely to perform better in mathematics than students who lack such skills. This view aligns with that of Theobald (2021) who reported that students who regularly practice self-monitoring and goal-setting strategies tend to demonstrate higher persistence and achievement in mathematics tasks. Similarly, Mutawah (2021) found that self-regulated learning significantly predicts mathematics achievement and reduces mathematics anxiety between secondary school students.

Apart from academic achievement, another important educational outcome associated with self-regulated learning is goal orientation. Goal orientation refers to the reasons or purposes students adopt while engaging in learning activities. According to Elliot and Hulleman (2017), goal orientation can be categorised into mastery goal orientation and performance goal orientation. Students with mastery goal orientation focus on learning, understanding, competence development, and personal improvement, whereas students with performance goal orientation focus on outperforming others, gaining recognition, or avoiding failure. It plays a crucial role in students' learning behaviours and academic outcomes. Mastery-oriented students are more likely to persist in difficult academic tasks, seek understanding of concepts, and employ effective learning strategies, while performance-oriented students may focus mainly on grades and social comparison (Mega, Ronconi, & De Beni, 2018). Researchers such as Panadero (2017) have established that self-regulated learning positively influences students' mastery goal orientation because students who regulate their learning tend to focus more on competence development and intrinsic motivation. Conversely, students with poor self-regulation skills may experience low motivation, weak persistence, and poor engagement in mathematics learning activities. All these have tendency to affect mathematics students' academic achievement and goal orientation negatively. It is against this background that this paper investigated the effect of self-regulated learning on achievement and goal orientation of senior secondary school mathematics students in Lagos State.

Statement of the Problem

The persistent poor performance of secondary school students in mathematics has remained a major concern in Nigeria's educational system. Despite the importance of mathematics in national development and its compulsory status in secondary schools, many students continue to perform poorly in both internal and external examinations (WAEC, 2023). Several efforts have been made by government, teachers, and educational stakeholders to improve students' achievement in mathematics through curriculum reforms, teacher training programmes, and improved instructional materials, yet the problem persists. One factor that may contribute to poor mathematics achievement is students' inability to regulate their own learning effectively. Many students lack important self-regulated learning skills such as goal setting, self-monitoring, time management, self-evaluation, and strategic studying. As a result, they often demonstrate poor study habits, low persistence in solving mathematical problems, weak motivation, and overdependence on teachers for learning (Panadero, 2017). In addition, many students appear to possess weak goal orientation toward mathematics learning. Some students are more interested in passing examinations than understanding mathematical concepts and developing long-term competence in mathematics. Such attitudes may negatively affect their academic achievement and goal orientation. However, studies have examined variables related to mathematics achievement and goal orientation, but the available literature shows that little or no empirical

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study exists on the effect of self-regulated learning on mathematics students' achievement and goal orientation in senior secondary schools, especially in Lagos State. This is the gap filled by this paper. Hence, this study investigated the effect of self-regulated learning on the achievement and goal orientation of senior secondary school mathematics students in Lagos State.

Research Objectives

The major objective of this study was to investigate the effect of self-regulated learning on achievement and goal orientation of senior secondary school mathematics students in Lagos State. Specifically, this paper sought to:

i. establish if significant difference exists in the academic achievement of Mathematics students exposed to self-regulated learning and control group;
ii. ascertain if significant difference exists in the goal orientation of Mathematics students exposed to self-regulated learning and control group;
iii. examine the gender differentials in academic achievement of Mathematics students exposed to self-regulated learning; and
iv. ascertain if gender difference exists in the goal orientation of Mathematics students exposed to self-regulated learning.

Research Questions

The following research questions guided this paper:

1. To what extent does significant difference exist in the academic achievement of Mathematics students exposed to self-regulated learning and control group?
2. How has goal orientation differed between Mathematics students exposed to self-regulated learning and control group?
3. To what extent will gender differential occur in the academic achievement of Mathematics students exposed to self-regulated learning in senior secondary schools?
4. To what extent does gender difference exist in goal orientation of Mathematics students exposed to self-regulated learning in senior secondary schools?

Research Hypotheses

The following null hypotheses were tested in this study at 0.05 level of significance:

H_{o1}: Mathematics achievement means scores will not significantly differ between students exposed to self-regulated learning and control group.

H_{o2}: There is no significant difference in goal orientation of Mathematics students exposed to self-regulated learning and control group.

H_{o3}: There is no significant gender difference in the mathematics academic achievement of students exposed to self-regulated learning in senior secondary schools.

H_{o4}: There is no significant gender difference in the goal orientation of Mathematics students exposed to self-regulated learning in senior secondary schools.

Methodology

This study was carried out in Lagos Mainland Local Government Area of Lagos State. The local government was is located in Education District IV, Lagos State, Nigeria. The study adopted quasi experimental design. The study's population was 181 Senior Secondary School (SSS) 1 Mathematics students in two randomly selected senior secondary schools in the chosen local government area. The sample size for this study was 60 Mathematics students. The assignment of the two schools into experimental (intervention) and control groups was done randomly. Similarly, a number of criteria was met by the participants before they were deemed qualified for selection into the experimental and control groups. These were: i. All the participants scored below forty percent in their math achievement test. Forty percent was used as qualification mark for study. ii. All the participants scored below forty percent in their motivational scale on goal orientation. As a matter of fact, the participants who qualified for inclusion in the experimental programme were randomly assigned into the experimental and control groups. Consequently, simple random sampling technique was used for selection of thirty (30) SS1 Mathematics students who qualified based on the inclusion criteria in each of the two (2)

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selected senior secondary schools. The instruments used for data collection were Mathematics Achievement Test (MAT) and Motivation Scale on Goal Orientation (MSGO).

MAT was constructed by the researcher on topics like indices, logarithms, sets, approximations and algebraic expression; and it consisted of 40 items. The MSGO was an adapted version of motivation scale designed by Muthee and Thomas (2009). The scale contained 32 items in total, where 18 items were positively worded and 14 items were worded negatively. The items with positive and negative wording were arranged randomly in the final scale. The responses to the items in the scale were structured on a-five-point likert of Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree. The weights assigned to the responses were 5, 4, 3, 2 and 1 respectively for positively worded items and 1, 2, 3, 4 and 5 respectively for negatively worded items. This scoring scheme was adopted to clearly indicate the levels of achievement motivation. MAT and MSGO were subjected to both face and construct validity. In addition, the reliability coefficients of the two instruments were ascertained using Cronbach Alpha method. The coefficients of reliability obtained were 0.78 and 0.81 for MSGO and MAT respectively. The treatment and administration of the instruments lasted for six (6) weeks. A baseline assessment was conducted for all the SS1 Mathematics students in the two chosen senior secondary schools. Pretest was conducted by the researcher using MAT and MSGO. The study had one experiment group and one control group. The experimental group was exposed to the self-regulated learning, while the students in the control group were taught using conventional method. Each of the groups was taught for five (5) weeks. The researcher taught each of the two classes twice in a week for duration of 40minutes per lesson. The re-administration of MAT and MSGO (posttest) to all participants in the experimental and control groups was done in the sixth week. This provided post-test data. The data collected were analysed using independent t-test at 0.05 level of significance.

Results

All the research questions raised in this paper were hypothesised and tested in this section.

H_{o1}: Mathematics achievement means scores will not significantly differ between students exposed to self-regulated learning and control group.

Table 1: Significant difference in the Mathematics achievement means scores between students exposed to self-regulated learning and control group

Groups	N	$\bar{x}$	Standard Deviation	df	t	Sig.
Experimental Group	30	30.93	4.97		27.505*	.000
Control Group	30	14.90	5.22	59		

* Significant

Table 1 reveals that the calculated "t" value is 27.505 with a returned p-value of 0.000. This returned p-value (0.000) is less than the level of significance (0.05). Based on these results, the null hypothesis which stated that "Mathematics achievement means scores will not significantly differ between students exposed to self-regulated learning and control group" is rejected. Hence, mathematics achievement means scores differed significantly between students exposed to self-regulated learning and control group. In addition, the post-test mean scores of students in the treatment group is higher than those in the control group by 16.03. Thus, self-regulated learning has significant effect on students' academic achievement in mathematics in senior secondary schools.

H_{o2}: There is no significant difference in goal orientation of Mathematics students exposed to self-regulated learning and control group.

Table 2: Significant difference in the goal orientation of Mathematics students exposed to self-regulated learning and control group

Groups	N	$\bar{x}$	Standard Deviation	df	t	Sig.
Experimental Group	30	121.73	12.07		14.362*	.003
Control Group	30	108.50	13.39	59		

* Significant

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Table 2 reveals that the calculated "t" value is 14.362 with a returned p-value of 0.003. This returned p-value (0.003) is less than the level of significance (0.05). Based on these results, the null hypothesis which stated that "There is no significant difference in goal orientation of Mathematics students exposed to self-regulated learning and control group" is rejected. Hence, significant difference exists in goal orientation of Mathematics students exposed to self-regulated learning and control group. Specifically, the post-test mean scores of students in the treatment group on goal orientation is higher than those in the control group by 13.23. Thus, self-regulated learning has significant effect on goal orientation of Mathematics students compared to the students in the control group.

H_{03}: There is no significant gender difference in the mathematics academic achievement of students exposed to self-regulated learning in senior secondary schools

Table 3: Significant gender difference in the mathematics academic achievement of students exposed to self-regulated learning in senior secondary schools

Gender	N	$\bar{x}$	Standard Deviation	df	t	Sig.
Male	18	31.50	3.82		1.643*	.113
Female	12	30.08	6.42	29		

* Not Significant

Table 3 reveals that the calculated "t" value of 1.643 is not significant since the returned p-value of 0.113 is greater than the criterion level of significance of 0.05. Hence, the null hypothesis which stated that "There is no significant gender difference in the academic achievement of Mathematics students exposed to self-regulated learning in senior secondary schools" is accepted. Thus, no significant gender difference exits in the academic achievement of Mathematics students exposed to self-regulated learning in senior secondary schools.

H_{04}: There is no significant gender difference in the goal orientation of Mathematics students exposed to self-regulated learning in senior secondary schools

Table 4: Significant gender difference in the goal orientation of Mathematics students exposed to self-regulated learning in senior secondary schools

Gender	N	$\bar{x}$	Standard Deviation	df	t	Sig.
Male	18	123.28	12.09		1.433*	.201
Female	12	121.42	12.17	29		

* Not Significant

Table 4 reveals that the calculated "t" value is 1.433 with a returned p-value of 0.201. This returned p-value (0.201) is greater than the level of significance (0.05). Based on these results, the null hypothesis which stated that "There is no significant gender difference in the goal orientation of Mathematics students exposed to self-regulated learning in senior secondary schools" is accepted. Hence, no significant gender difference exits in the goal orientation of Mathematics students exposed to self-regulated learning in senior secondary schools.

Discussion of the Findings

This paper established that mathematics achievement means scores differed significantly between students exposed to self-regulated learning and control group. Specifically, the mathematics students exposed to self-regulated learning performed better than those in the control group by average of 16.03 marks. Hence, self-regulated learning has significant effect on students' academic achievement in mathematics in senior secondary schools. Supporting this finding, Broadbent and Poon (2015) reported that students who employ self-regulation strategies such as goal setting, time management, and self-monitoring tend to achieve higher academic outcomes. Also, Dent and Koenka (2016) who conducted a meta-analysis found that self-regulated learning strongly predicts students' academic achievement across educational levels. Similarly, Mutawah (2021) found that self-regulated learning significantly predicts mathematics achievement and reduces mathematics anxiety among secondary school students.

This study found that significant difference exists in goal orientation of Mathematics students exposed to self-regulated learning and control group. Specifically, the post-test mean scores of students in the treatment group

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on goal orientation is higher than those in the control group by 13.23. Therefore, self-regulated learning has significant effect on goal orientation of Mathematics students compared to the students in the control group. Corroborating this finding, Panadero (2017) reported that self-regulated learning positively influences students' mastery goal orientation because students who regulate their learning tend to focus more on competence development and intrinsic motivation. Also, Cho, Kim and Choi (2021) affirmed that students with effective self-regulated learning skills often demonstrate higher academic confidence, stronger intrinsic motivation, and more positive attitudes toward mathematics learning.

This study revealed that there was no significant gender difference in the academic achievement of Mathematics students exposed to self-regulated learning in senior secondary schools. This indicates that male and female Mathematics students exposed to self-regulated learning in senior secondary schools were not differed significantly in their academic achievement. This finding aligns with that of Dent and Koenka (2016) who found no significant gender differences in self-regulated learning and mathematics achievement. Similarly, Salman, Mohammed and Ogunlade (2020) reported that male and female students with effective study habits and self-regulated learning skills perform significantly better in mathematics than students with poor self-regulation skills. Also, Usman and Nwoye (2021) found that self-regulated learning positively predicts students' mathematics achievement and academic motivation. Hence, no significant gender difference exists in the academic achievement of Mathematics students exposed to self-regulated learning in senior secondary schools.

This study also revealed that no significant gender difference exits in the goal orientation of Mathematics students exposed to self-regulated learning in senior secondary schools. This means that male and female Mathematics students exposed to self-regulated learning in senior secondary schools are not differed in their goal orientation. Corroborating this finding, Panadero (2017) reported that students (male and female) who possess strong self-regulated learning skills are more likely to adopt mastery-oriented goals because they focus on personal growth, competence development, and independent learning. Equally, Mega, et al. (2018) found among others that self-regulated learning positively predicts mastery goal orientation among secondary school students. This implies that no significant gender difference exits in the goal orientation of Mathematics students exposed to self-regulated learning.

Conclusion

Self-regulated learning is an important predictor of mathematics achievement and positive goal orientation among senior secondary school students in Lagos State. This is due to the fact that students who effectively regulate their learning tend to perform better academically and develop stronger mastery-oriented goals. Hence, promoting self-regulated learning strategies among students can enhance their learning outcomes in mathematics. Therefore, this study concluded that self-regulated learning has significant effect on the achievement and goal orientation of senior secondary school mathematics students in Lagos State.

Recommendations

The following recommendations are hereby suggested:

1. Mathematics teachers should teach students self-regulated learning strategies such as goal setting, time management, and self-monitoring. These strategies have the tendency to enhance students' academic achievement in Mathematics.
2. Secondary school administrators should organise workshops and seminars for Mathematics students on effective study skills and self-regulated learning. This will enhance students' goal orientation in senior secondary schools.
3. Curriculum planners should integrate self-regulated learning activities into mathematics instruction. This will promote the use of self-regulated learning as strategy to enhance both male and female students' academic achievement in Mathematics.
4. Government should provide supportive learning environments that will encourage independent learning among Mathematics students in senior secondary schools. This will enhance both male and female students' goal orientation in senior secondary schools.

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