



The Role of Students' Motivation and Self-Concept as Predictors of Mathematics Performance in Secondary Schools

T.O. Abiodun^{1,*}, T. W. Chinaka², A. A. Asanre²

¹Tai Solarin University of Education, Nigeria

²University of Zululand, South Africa

*Correspondence: E-mail: abiodunto@tasued.edu.ng

ABSTRACT

Student performance in mathematics remains a significant concern in secondary education, particularly because many learners struggle due to low motivation and poor self-concept. This study aimed to investigate how students' motivation and self-concept predict their performance in senior secondary school mathematics in Ogun State, Nigeria. A descriptive survey research design was employed, involving 306 Senior Secondary School Two (SSS2) students selected through simple random sampling. Data were collected using a Mathematics Performance Test, Mathematics Self-concept Scale, and Mathematics Motivation Questionnaire. The findings revealed that both students' motivation and self-concept showed a significant and positive relationship with mathematics performance because students who believed in their abilities and were motivated performed better. Together, these factors explained the variance in mathematics achievement. This study underscores the importance of enhancing motivation and self-concept to improve mathematics performance, offering valuable insights for educators and policymakers to strengthen mathematics education outcomes.

© 2025 Kantor Jurnal dan Publikasi UPI

ARTICLE INFO

Article History:

Submitted/Received 28 Nov 2024

First Revised 27 Dec 2024

Accepted 12 Feb 2025

First Available online 13 Feb 2025

Publication Date 01 Mar 2025

Keyword:

Mathematics,
Motivation,
Performance,
Predictors,
Self-concept.

1. INTRODUCTION

A student with a solid understanding of mathematics is well-equipped to tackle a wide variety of real-world challenges. Modern technology cannot exist without modern science, which cannot exist without mathematics (Mohamed & Waheed, 2014). Likewise, modern society cannot exist without modern technology. Since student success in mathematics will affect both the students and the country as a whole, stakeholders in education have long been concerned about students' performance in the subject. This may help to explain why examination organizations like the National Examination Council (NECO) and the West African Examination Council (WAEC) are making an intense campaign to improve students' achievement in mathematics. Student achievement can be classified as either high or low. It is high when the learner's performance meets or exceeds the teacher's planned outcome and low when the student does not meet the teacher's desired expectation or benchmark. One could argue that a wide range of factors contribute to either good or low mathematics achievement. Akinoso (2011) listed a number of these factors, including those related to teachers, schools, students, parents, and the government. This suggests that to find new and creative approaches to teaching and studying mathematics, a constant investigation of many factors is necessary if students' performance in the subject is to be improved. Despite several initiatives to enhance the teaching of mathematics in Nigerian secondary schools, there is a significant disparity between the amount of research that is being done to enhance mathematics teaching and the performance of secondary school students in the subject. This disparity is particularly noticeable during the disclosure of the West Africa Senior Secondary School Certificate Examination (WASSCE) results. Out of 1,805,216 students who took the examination, 503,275 candidates failed mathematics, according to statistics from the May/June 2024 examination. The aforementioned figure suggests that there exists a concerning disparity between the methods implemented to enhance mathematics education and the academic achievement of students in secondary schools. Thus, the purpose of this study is to ascertain if students who cultivate a positive self-concept and uphold a strong sense of motivation are more likely to perform academically and overcome challenges in mathematics, as well as to explore the relationship between the identified student variables and students' performance in the subject. Sincero (2020) defined self-concept as the entirety of our systematically organized views, preferences, opinions, and attitudes about our individual lives. It is our perception of who we are and how we ought to act out the different roles we play in life. There are three categories for self-concept. One learns their self-concept first. As people age, their self-concept changes and is developed. Second, one's self-concept is structured. Students who perform well in mathematics and believe they are valuable in the subject are likely to create a favorable opinion of themselves in mathematics. Thirdly, one's self-concept is ever-changing. Since people encounter a variety of challenges in life, their beliefs could also vary based on the type of event someone encounters and the way they handle it (See link: <http://bit.ly/2KrXjqG>). The way that students perceive themselves in any academic subject matter is greatly influenced by their school experiences, particularly in courses where the majority of students find the subjects difficult (Peteros, 2019). Numerous studies have looked at the relationship between academic performance or achievement and one's self-concept. Yara (2020) and Valentine et al. (2018), the majority of this research lends credence to the idea that self-concept is a powerful facilitator of academic achievement and that changes in self-concept, whether positive or negative, typically result in corresponding improvements or declines in academic performance. For instance, several reports (Kamoru & Ramon, 2017) used a sample size of 200 SS2 students (124 females and 74 males) to examine

the relationship between students' self-concept, attitudes toward mathematics, and mathematics achievement. The findings indicated a significant relationship between student performance in mathematics and their self-concept. Positive self-concept can increase motivation by promoting a sense of belief that one can do tasks and achieve goals; therefore, motivation is factored in as one of the predicted variables in this study.

An internal force that stimulates and directs action is referred to as motivation (Guay & Frederic, 2015). Due to its substantial impact on student's academic achievement, motivation has drawn considerable attention from several academics with varying psychological and philosophical stances in a variety of fields of study, particularly psychology, and education. Pupils who lack ambition for success won't put much effort in their studies. Indeed, according to several studies (Tucker *et al.*, 2018), academic achievement is solely influenced by motivation; every other factor has an indirect impact on motivation. College students' academic performance is influenced by their motivation (Ahmad & Rana, 2015). There are two main categories of motivation: extrinsic and intrinsic. Whereas intrinsic motivation is predicated on internal components like self-determination, effort, challenge, and curiosity, extrinsic motivation is based on external ones like rewards and penalties (Engin, 2020). Adamma *et al.* (2018) conducted a study on the impact of motivation on students' academic performance in mathematics. The purpose of the study was to determine how students' motivation affected their academic achievement in mathematics. A descriptive research design was adopted for the study. The researcher chose 200 primary six pupils as the study's sample size. To select the schools, the researcher employed a simple random sample method. The tools utilized to gather information are the Academic Motivation Scale and the Mathematics Achievement Test. The data was analyzed using the T-test and Pearson product movement correlation. The findings demonstrated that students' academic performance is enhanced by motivation.

Edward Deci and Richard Ryan's self-determination theory (SDT), which was put forth in the 1980s, serves as the foundation for this study. A more contemporary advancement in motivating study is the self-determination theory. SDT is a theory of motivation that depends on conventional empirical methodologies for both theory construction and guidance in the classroom. Individuals are driven by their needs for relatedness, competence, and autonomy, according to SDT theory. In addition to boosting motivation and self-concept into a dynamic motivation and self-concept deemed necessary, there is a need to develop techniques to support students' positive mathematical self-concept, motivation, and achievement. Thus, to increase students' interest in mathematics, teachers should provide them with a variety of learning opportunities in the classroom.

With the full assistance of the teachers, improving students' motivation and self-concept may help close the learning gap in mathematics. To determine whether students' performance in mathematics at the secondary school level can be predicted, this study looks at motivation and self-concept. The objectives of this study are to determine the relative contributions of these factors to academic achievement in mathematics and to examine the relationship between students' motivation, self-concept, and performance in mathematics.

These research questions served as a guide for the study.

- (i) What is the relationship among students' motivation, self-concept, and students' academic performance in mathematics?
- (ii) What are the relative contributions of students' motivation and self-concept to students' academic performance in mathematics?

2. METHODS

2.1. Research Design and Population

For this study, a descriptive survey design approach was chosen. All Ogun State students in Senior Secondary School Two (SSS2) made up the study's population.

2.2. Sample and Sampling Technique

The sample for the study included three hundred and six (306) SS II secondary school students from Ogun State, Nigeria. Six (6) public senior secondary schools in the Ijebu Ode, Odogbolu, and Sagamu Local Government Areas gave the sample. There were two schools chosen from each local government area. While the respondents and schools were selected using a simple random sampling technique, the local government was selected using a purposeful sampling method.

2.3. Instruments

The instruments used are:

- (i) Mathematics Motivation Questionnaire (MMQ): The MMQ is a tool used to assess students' intrinsic and extrinsic motivation for mathematics. It was adapted from Singh (2015). There were thirty-two items in the original questionnaire. Following the change, there are eighteen items in the MMQ. The MMQ items are organized into four Likert scale categories: strongly agreed (SA) with four points, agreed (A) with three points, disagreed (D) with two points, and strongly disagreed (SD) with one point. The score ranges from 18 to 72. By applying Cronbach Alpha estimation, the reliability of MMQ was 0.87.
- (ii) Mathematics Self-Concept Scale (MSCS): This scale was adapted from Arens (2012). MSCS measured students' self-concept in mathematics. There were fifteen items on the modified scale. The MSCS items are organized into four Likert scale categories: severely disagreed (SD) with one point, strongly agreed (SA) with four points, agreed (A) with three points, and disagreed (D) with two points. MSCS has a Cronbach Alpha reliability coefficient of 0.82.
- (iii) Mathematics Performance Test: The Mathematics Performance Test is an instrument that was developed by researchers to measure student performance in mathematics. MPT consists of forty multiple-choice questions with four possible answers. The test-retest reliability technique with a coefficient of 0.76 was used to evaluate the reliability of the Mathematics Performance Test.

3. RESULTS AND DISCUSSION

3.1. Research Question One: What is the Relationship Among Students' Motivation, Self-Concept, and Student's Academic Performance in Mathematics?

Table 1 shows that students' academic achievement in mathematics is positively correlated with the independent factors (motivation and self-concept). ($r = 0.135$, $p < 0.05$ for self-concept and $r = 0.78$, $p < 0.05$ for students' motivation). This finding suggests that students' motivation and self-concept will have a positive effect on their mathematical ability.

Table 1. Correlation matrix of the dependent variable and the independent variable.

Correlations	Performance	Students' motivation	Self-concept
Performance	1		
Students' motivation	0.780**	1	
Self-concept	0.135**	0.782**	1

** The correlation is significant at the two-tailed 0.05 level.

3.2. Research Question Two: What are the Relative Contributions of Students' Motivation and Self-Concept to Students' Academic Performance in Mathematics?

The regression of the combined independent variable (motivation and self-concept) on the students' performance scores in mathematics is shown in **Table 2**. A significant outcome ($F = 3.098$, $p < 0.05$) is shown in the result. This suggests that the independent variables self-concept and motivation together accounted for a significant amount of the variance in the students' mathematics performance. **Table 3** additionally displays a multiple correlation coefficient of 0.142 and an R-Square value of 0.020, indicating that self-concept and motivation, the independent factors, accounted for 14.2% of the variance in the dependent variable, which is students' performance in mathematics. Furthermore, **Table 4** displays the relative contributions of each independent variable together with their corresponding magnitudes of contribution to the dependent variable (motivation, -0.097) and self-concept, 0.226).

Table 2. Regression of students' motivation and self-concept on students' performance in mathematics.

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	271.546	2	135.773	3.098	0.047 ^b
Residual	13236.893	302	43.831		
Total	13508.439	304			

Dependent Variable: Students_Performance

Predictors: (constant). Students_motivation, Self_concept

Table 3. Model summary.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.142 ^a	0.020	0.014	6.620

Predictors: (constant). Students_motivation, Self_concept

Table 4. Contribution of each of the independent variables to the performance of the students in Mathematics.

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	24.617	1.565		15.726	0.000
Students' motivation	-0.097	0.127	-0.070	-0.765	0.445
Self-concept	0.226	0.109	0.190	2.075	0.039

Dependent Variable: Students_Performance

The study's findings revealed a positive relationship between students' academic achievement in mathematics and their motivation and self-concept. Students who are driven to succeed possess the ability to establish strong yet attainable objectives; they prioritize their accomplishments over the benefits of winning. Furthermore, academic motivation (particularly the kind that allows students to set achievement goals and then work tirelessly to reach those goals) orients students toward learning and understanding, the development of new skills and cognitive problem-solving strategies, and a focus on self-improvement using self-referenced standards. This outcome is consistent with the literature (Binoy & Bijan, 2023), showing that motivation enhances students' academic performance. Additionally, the results of this study on the influence of motivation on academic achievement concur with those of the literature (Tella, 2017). The results of the study showed a clear connection between the academic achievements of students and their drive for achievement. Parallel to this, the regression analysis's findings showed that student motivation is a reliable indicator of performance. Additionally, some researchers (Ahmad & Rana, 2015) found a favorable correlation between motivation and academic achievement. The results in **Table 1** showed a significant correlation between students' self-concept and their secondary school mathematics performance. This implies that a student's performance in mathematics increases with their level of self-concept. This result is consistent with the findings of numerous researchers (Kamoru & Ramon, 2017), who found a definite positive correlation between students' academic achievement and their self-concept through a variety of studies. The results of this study, however, differed from those of Marsh and Craven (2016), who contend that prior achievement shapes academic self-concept rather than academic achievement influencing academic self-concept. Marsh and Craven (2016) also showed a substantial relationship between academic achievement and self-concept and achievement motivation. Academic achievement serves as a motivational indicator. A student who performs well academically and is successful in school has to be positively motivated to learn.

4. CONCLUSION

To predict the achievement of pupils in senior secondary school mathematics in Ogun State, Nigeria, this study looked at students' motivation and self-concept. The study aims to investigate the correlation between students' motivation, self-concept, and performance in mathematics, as well as ascertain the specific contributions of each of these factors to mathematical achievement. Results of the findings revealed that students' motivation and their performance in mathematics were found to be positively related. Also, each of the identified variables contributed to students' performance in mathematics.

5. ACKNOWLEDGMENT

We would like to thank all those who have contributed to the completion of this research. Also, many thanks to the principals, mathematics teachers, and students who participated in the study.

6. 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.

7. REFERENCES

- Adamma, A.N., Ekwutosim, O.P., and Unamba, E.C. (2018). Influence of extrinsic and intrinsic motivation on pupils academic performance in mathematics. *Supremum Journal of Mathematics Education*, 2(2), 52-59.
- Ahmad, I., and Rana, S. (2015). Affectivity, achievement motivation, and academic performance in college students. *Pakistan Journal of Psychological Research*, 27(1), 107-120.
- Akinoso, S.O. (2011) Correlates of some factors affecting students' achievement in secondary school mathematics in osun state. *International Journal of Education, Science, Mathematics, and Environmental Studies*, 3(10), 83- 95.
- Arens, A.K. (2012). Mathematics self-concept and mathematics achievement: A cultural study. *Journal of Cross-Cultural Psychology*, 43(6), 888-906.
- Bino, R., and Bijan, S. (2023). Motivation towards mathematics in relation to academic performance of 10th grade students. *International Journal of Research and Review*, 10(1), 277-283.
- Engin, G. (2020). An examination of primary school students' academic achievements and motivation in terms of parents' attitudes, teacher motivation, teacher self-efficacy and leadership approach. *International Journal of Progressive Education*, 16(1), 257– 276.
- Guay, Frederic. (2015). Academic Self-Concept, autonomous academic motivation, and academic achievement: Mediating and additive effects. *Learning and Individual Differences*, 20(6), 644-653.
- Kamoru, U., & Ramon, O. G. (2017). Influence of self-concept, motivation, study habit, and gender on attitude and achievement of secondary school students in mathematics. *Journal for Leadership and Instruction*, 16(1), 49-52.
- Marsh, H. W., and Craven, R. G. (2016). Reciprocal effects of self-concept and performance from a multidimensional perspective: Beyond seductive pleasure and unidimensional perspectives. *Perspectives on Psychological Science*, 10(1), 133-163.
- Mohamed, L., and Waheed, H. (2011). Secondary students' attitude towards mathematics in a selected school of Maldives. *International Journal of Humanities and Social Science*, 1(15), 277-281.
- Peteros, E., Gamboa, A., Etcuban, J. O., Dinauanao, A., Sito, R., and Arcadio, R. (2019). Factors affecting mathematics performance of junior high school students. *International Electronic Journal of Mathematics Education*, 15(1), 135-147.
- Singh, A. K. (2015). Mathematics motivation questionnaire: A study of reliability and validity. *Journal of Mathematics Education*, 8(2), 1-12.
- Tella, A. (2017). The impact of motivation on student's academic achievement and learning outcomes in mathematics among secondary school students in Nigeria. *Eurasia Journal of Mathematics, Science and Technology Education*, 3(2), 149–156.

- Tucker, C. M., Zayco, R. A., and Herman, K. C. (2018). Teacher and child variables as predictors of academic engagement among low-income African American children. *Psychology in the Schools, 39*(4), 477-488.
- Valentine, J. C., Dubois, D. L., and Cooper, H. (2018). The relations between self-beliefs and academic achievement: A systematic review. *Educational Psychologist, 39*(2), 111-133.
- Vansteenkiste, M., Simons, J., Lens, W., Soenens, B., and Matos, L. (2018). Examining the impact of extrinsic versus intrinsic goal framing and internally controlling versus autonomy-supportive communication style upon early adolescents' academic achievement. *Child Development, 76*(1), 483–501.