



Influence of Motivation on Students' Attitude and Academic Achievement in Mathematics in Igalamele/Odolu Local Government Area

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Abstract

The study examined the influence of motivation on students' attitude and academic achievement in mathematics. The study was guided by two research questions and two null hypotheses. The study adopted a causal-comparative research design. The population of the study comprises 393 senior secondary school 11 (SS11) students of all the twelve public secondary schools in Igalamela/odolu local government area of Kogi state. A sample of 207 SS11 students was used for the study. Three instruments viz: Student Motivation Scale (SMS), Student Attitude Scale (SAS) and Mathematics Achievement Test (MAT) were used for data collection. The instruments were subjected to face, content and construct validation. Specifically, SMS, SAS and MAT were all face validated, SMS and SAS were construct validated and MAT was content validated using test blue print. The reliability of SMS, and SAS were determined using Cronbach Alpha and the indices of 0.75, 0.72 respectively were obtained. The reliability of MAT was determined using kuder Richardson formula 20 (K-R 20) which gave an index of 0.70. The data collected were analyzed using SPSS version 23 which gave the mean and standard deviation that was used to answer the research questions and analysis of variance (ANOVA) which was used to test the hypotheses at 0.05 level of significance. It was revealed that students who had high motivation to learn had positive attitude towards mathematics and improved academic achievement. The findings of the study revealed that there is significant influence of motivation on students' attitude and academic achievement in mathematics. Conclusion was drawn and implications of the findings of the study were highlighted. It was recommended among others that mathematics teachers should utilize technology and gamification elements where necessary to motivate learners, change their attitudes and improve academic achievement.

Introduction

Motivation may play a significant role in shaping students' attitudes and improve the persistent poor/fluctuating academic achievement in mathematics. Understanding these psychological construct variables within the learner may help educators create more effective learning environment which consequently leads to more inclusive and engaging learning environments that may cater for individual needs and promote educational development especially in Mathematics.

Mathematics is a body of knowledge that is centered on many concepts such as number, quantity, shape, structure, space and change, which is well organized. Simmons (2022) defined mathematics as the science of structure, order and relation that has evolved from elemental practice of counting, measuring and describing the shapes of objects. It implies that all natural and artificial activities that involve counting, measuring and the shapes of objects

pervade mathematics. This implies that mathematics is the subject of the universe since every activities of mankind involving counting, measuring and shapes of objects are embedded in mathematics. Reeve (2015) defined mathematics as a language of numbers, patterns and the relationship that ties science, technology and engineering together. Hence, it is the bedrock of science and technology and consequently the springboard of national development.

Mathematics is important to human existence. In line with this, Fakuade in Enemali (2017) stated that beginners will take mathematics as a science of numbers, but at a later stage they discovers that mathematics not only deal with numbers but involve virtually all activities of mankind in an effort to subdue nature and bring it to his comfort. The place of its importance can be fully envisaged when we imagine a world without

mathematics. In line with this assertion, Afolabi (2021) stated that in a world without mathematics, the economics, the politics and policies, and the sciences will be without quantity or definite descriptions full of inaccuracies. Hence, the outcome will definitely be a world of confusion, uncertainties and chaos. Therefore, man cannot do without at least a basic knowledge of mathematics.

The basic knowledge of mathematics is so universal and indispensable for man and other creatures. Hence, every individual in the society require the knowledge of mathematics to function effectively and efficiently in today's world irrespective of his or her profession (Kravitz, Saleem, Baker, Underleider, & Mishkin, 2013). To its universality, every human being instinctively needs mathematics for daily activities consciously or unconsciously. For instance, right from getting up early hours of the day at cockcrow to the ringing of an alarm, reading of time on a clock, preparing recipe in a kitchen, serving and consuming food, dialing numbers on a phone, checking the mileage of a car, halting at a petrol station, waiting at traffic check points, and in fact, almost every moment we do some simple calculations at the back of our mind. If mathematics is the language of the world (Ali, 2016), then it would be pertinent for countries of the world to embrace it for the welfare of her inhabitants. Ali maintained that natural formations such as, conic shell of snails, the circular cobwebs of spiders, the hexagonal combs of bees, the timing crow of cocks and doves, and occurrences such as the counted days of the weeks, the rising and setting of the sun, the crescent and setting of the moon, etc also has mathematical connections. These natural formations/occurrences according to Ali are enshrined in the different branches of mathematics.

Mathematics is made up of many branches such as sets, trigonometry, indices/logarithm, probabilities, statistics, logic, algebra, etc. These branches if well presented to the students would encourage logical and analytic thinking that can tackle the problem of man. This assertion implies that the teaching/learning of mathematics is vital and imperative for Nigeria in order to ensure independence, self-reliance, increased prosperity and return to her lost place among the present developed countries of the world. Despite this place of mathematics, it is faced with lots of challenges some of which emanates from homes and are being carried to the mathematics domain.

Contrary to the above, mathematics has been held in high esteem as it is in our schools today. For instance, in Nigeria, mathematics in secondary

schools is one of the core subjects as reflected in the Federal Republic of Nigeria, National Policy on Education (NPE, 2013) and with minimum number of 4 periods in a week compared to other subjects which have 2-3 periods. Unlike some other subjects, mathematics is compulsory for all students in secondary schools to the extent that a pass is made the minimum requirement for promotion to the next class. With all these emphasis, students' academic achievement in mathematics still remain poor and fluctuating (WAEC Chief Examiners' report 2016-2024). For instance, 38.93% of students obtained credit pass and above in mathematics in 2016, 49.00% in 2017, 36.00% in 2018, 32.30% in 2019, 34.14% in 2020 and 38.68% in 2021. Considering the outcomes of these results, students become uninterested in learning the subject. This situation calls for emphasis on motivation of students to enhance positive attitude and improved academic achievement in mathematics.

Motivation is the desire and the willingness which someone develops to facilitate the learning of something. According to Luthans (2012), motivation is a process which starts with physiological and psychological deficiency or need that advocates a behavior or drive which is aimed at a goal or incentives. It is a complex part of human psychology and behavior that influences how individuals choose to invest their time, how much energy they exert in a given task, how they think and feel about the task, and how long they persist in the task (Bakar 2014).

Learners may not have the desire to learn but may be attracted by some factors. Based on Self-determination Theory (SDT) by Edward Deci and Ryan Richard (1985), learners may be driven to learn by two forces— internal and external or intrinsic and extrinsic. The theory gave rise to the two types of motivation; intrinsic and extrinsic motivation: In intrinsic motivation, stimulus is internal to the person; it can be biological, emotional, spiritual, or social. In this case, there are no external rewards. The activity is undertaken for self-pleasure and individual satisfaction. In extrinsic motivation, stimulus is outside the person, it can be there in the form of operant conditioning or social cognition (Filgona, Sakiyo & Gwany 2020). It may be in the form of some kind of reward, social recognition, or cash and kind appreciation. Filgona, Sakiyo and Gwany further explained that extrinsic motivation is caused by any number of outside factors that might include the hope of financial reward; need to pass an examination or the possibility of the future level. So, extrinsic motivation is any stimulus that comes from outside of learner, and which drives the learner in the learning process. From the definitions of the above authors,

the researchers see motivation as that desire which makes a learner to perform one learning activity with the motive of a defined interests, reward, expectancy, attitudes and purposes. The influence of this motivation as a psychological construct on students' attitude and academic achievement in mathematics has not drawn much attention of researchers of literature. This present study will therefore examine the influence of motivation on mathematics students' attitude and academic achievement.

Attitude is an in-built learned ways of positively or negatively responding to ideas, materials, events, objects or persons in one's environment. Attitude is a situation by which an individual form a mentality to act in a certain way as a result of their experiences. According to Jin & Oh (2022), attitudes are positive or negative emotions, beliefs, and behaviours which affect individuals' way of thinking, acting, and behaving. Attitudes though not directly observable are inferred from observable responses and behaviours which reflect in a pattern of beliefs and emotions.

Students' attitude towards learning, especially mathematics may determine their success in the subject. Some research studies like Tuncer & Yilmax (2020), Melad (2022), support the fact that students' success in mathematics depends on the learners' attitude towards the subject as this determines their ability, willingness to learn, choice of action and response to challenges. Among others, the above studies have examined the relationship between students' attitude and academic achievement.

Academic achievement is the measured knowledge a learner gains from a set of instructional activities in an academic environment. Academic achievement is the outcome of education, the extent to which a student, teacher or institution has achieved their educational goals (Unity & Igbudu, 2015). It is the display of knowledge gained or skills developed by students in school subjects (Busari, 2014). In the same vein, Ganai and Mir (2013) define academic achievement as the knowledge obtained, or skills developed in the school subjects usually designed by test scores or by marks assigned by teachers or both. Thus, academic achievement is properly measured according to the knowledge, experience and abilities that learners gain after completing an academic course.

Research Questions

The following research questions were posed to guide the study:

1. What is the influence of motivation on the mean scores of students' attitude in mathematic?

2. What is the influence of motivation on the mean scores of students' academic achievement in mathematics?

Hypotheses

The following null hypotheses were formulated to guide the study and was tested at 0.05 level of significance:

H₀₁: There is no significant influence of motivation on the mean scores of students' attitude in mathematics.

H₀₂: There is no significance influence of motivation on the mean scores of students' academic achievement in mathematics.

Methods

Design of the Study

The research design adopted for this study was the causal-comparative design as it seeks to establish cause-effect relationship between independent variables and the dependent variable without any control over the variables of interest and therefore the researchers cannot manipulate them.

Study Participants

The population of this study consist 393 senior secondary school two (SS11) mathematics students in all the 12 public secondary schools in Igalamela\Odolu local government area in the 2023/2024 academic session as provided by the Kogi State Ministry of Education, Science and Technology. The sample of this study comprises 207 SS11 students. The sample size was calculated using the Taro Yamane (1967) formula with a margin error of 5%. Simple random sampling technique was used to draw six (6) secondary schools from the 12 public secondary schools in the study area. The use of simple random sampling technique was to give equal chance to all the schools being selected. The drawing of the six (6) schools was done by balloting without replacement. The researchers then employed proportionate sampling technique to draw 9/10 proportion of the respondents from each of the six (6) sampled schools.

Measures

The measures that were used for this study are: Students' Motivation Scale (SMS), Students' Attitude Scale (SAS) and Mathematics Achievement Test (MAT). The Student Motivation scale (SMS) adapted and modified from Academic motivation Scale (AMS) by Vellarbege (1996) comprises 23 items using a four-point likert scale A, SA, SD, D designating Agree, Strongly Agree, Disagree,



Strongly Disagree respectively. The Students' Attitude Scale (SAS) adapted and modified from Sanchal and Sharma (2017) Students' Attitude Scale (SAS) comprises 25 question items of 4-Likert scale with symbols SA, A, SD, D denoting Strongly Agree, Agree, Strongly Disagree and Disagree respectively. The Mathematics Achievement Test (MAT) consists 30 multiple choice test items, which was developed by the researchers using test-blue print drawn from sets, trigonometry, probabilities, and logarithm and indices. The topics forms the major contents of the SS11 syllabus as enshrined in the curriculum. The measures were validated by three experts, SMS and SAS were construct validated by trial testing on 50 students of community secondary school Ugwolowo, Ofu Local Government Area and subjecting the responses to factor analysis and MAT was content validated. The reliability indices of SMS and SAS

yielded 0.75 and 0.72 respectively while that of MAT was obtained using Kuder-Richardson 20 (K-R 20) and it yielded an index of 0.70.

Data Collection Procedure

The measures were distributed to all the participants in five working days. The researchers collected all the measures distributed each day in order to avoid missing of the measures and alteration of responses.

Data Analysis

To analyze the data, statistical package for social sciences (SPSS) which gave the mean and standard deviation used to answer all the research questions and Analysis of Variance (ANOVA) used to test the hypotheses at 0.05 level of significance was employed.

Results

In line with the research questions and hypotheses, the following results were obtained:
 What is the influence of motivation on the mean scores of students' attitude towards mathematics?

Table 1: Mean analysis of the influence of motivation on students' attitude towards mathematics

Motivation	N	Mean	Std. Deviation	Df	t	Sig.
Low Motivation	167	79.80	5.26	205	-3.905	.000
High Motivation	40	83.70	7.19			

Table 1 shows that mathematics students who had low motivation to learn had a mean attitude score of ($M = 78.80, SD = 5.26$), while those who had high motivation to learn had a mean attitude score of ($M = 83.70, SD = 7.19$). This shows that students who had high motivation to learn had a higher mean attitude score than those who had low motivation to learn. However, the standard deviations of 5.26 and 7.19 indicate that the individual attitude scores of the

students who had high motivation varied more from their group mean than those who had low motivation.

Table 1 reveals that there is a significant difference in the mean attitude scores of students who had low motivation and those who had high motivation in favour of those who had high motivation, $t(205) = -3.905, p = .000$. Thus, the null hypothesis is rejected, ($p < .05$). This implies that motivation influences students' attitude towards mathematics.

Table 2: Mean analysis of the influence of learning style on students' attitude towards mathematics

Motivation	N	Mean	Std. Deviation	Df	t	Sig.
Low Motivation	167	23.59	4.57	205	-3.565	.000
High Motivation	40	26.20	2.08			

Table 2 shows that mathematics students who had low motivation to learn had a mean achievement score of ($M = 23.59, SD = 4.57$), while those who had high motivation to learn had a mean achievement score of ($M = 26.20, SD = 2.08$). This shows that students who had high motivation to learn had a higher mean achievement score than those who had low motivation to learn. Besides, the standard

deviations of 4.57 and 2.08 indicate that the individual attitude scores of the students who had low motivation varied more from their group mean than those who had high motivation.

Table 2 reveals that there is a significant difference in the mean achievement scores of students who had low motivation and those who had high motivation in favour of those who had high

motivation, $t(205) = -3.565$, $p = .000$. Thus, the null hypothesis is rejected, ($p < .05$). This implies that motivation influences students' achievement in mathematics.

Discussion of the Findings

The result of the influence of motivation on students' attitude towards mathematics showed that mathematics students who had high motivation to learn had a higher mean attitude score than those who had low motivation to learn. However, further analysis indicated that the individual attitude scores of the students who had high motivation varied more from their group mean than those who had low motivation. Thus, there is a significant difference in the mean attitude scores of students who had low motivation and those who had high motivation in favour of those who had high motivation. This corroborate with the findings of Oyedeji (2017) which revealed that all the motivational factors have positive and significant influence on students' attitude towards learning. Similarly, the findings also conforms the study by Ampadu and Derrick (2022) which revealed a positive influence of motivation on students' attitude towards learning. In their study motivated students were found to show positive attitude towards mathematics than students that were not motivated. Therefore, the findings which revealed that motivation of learners have significant influence on their attitude towards the learning of mathematics is in order.

The result of the influence of motivation on students' academic achievement in mathematics revealed that students who had high motivation to learn had a higher mean achievement score than those who had low motivation to learn. Besides, the individual attitude scores of the students who had low motivation varied more from their group mean than those who had high motivation. The result of the hypothesis revealed that motivation of students has significant influence on their academic achievement in mathematics. Students who had high motivation to learn had a higher mean achievement score than those who had low motivation to learn. Further analysis revealed that there is a significant difference in the mean achievement scores of students who had low motivation and those who had high motivation in favour of those who had high motivation. This means that the higher the level of motivation of the students, the higher their academic achievement and the lower their level of motivation, the lower their level of academic achievement. Hence, if students are motivated either intrinsically or extrinsically, their academic achievement will improve. This conform

the study by Ugama (2018) which revealed that motivation of secondary school students by parents will improve their academic achievement in mathematics. Similarly, study by Windaline, Paguican and Leandro (2023) revealed that the higher the level of motivation of students, the higher their level of academic achievement. Hence, the findings which revealed that motivation of students improve their academic achievement in mathematics is in order.

Conclusions

The study concluded that motivation of students in mathematics influences their negative attitudes towards learning the subject. The change in these students' attitude towards mathematics also improves and stabilizes their poor academic achievement.

Recommendations

Based on the findings of the study, the following recommendations have been compiled

- Mathematics teachers should utilize technology and gamification elements where appropriate to motivate learners, change their attitudes and improve academic achievement.
- Parents can foster positive attitude and improve academic achievement by collaborating with the teachers to identify their child's strengths and weaknesses in learning, enhance motivation through positive attitude, acknowledge and praise their progress and setting realistic educational goals.

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