

The Impact of Motivation on Student's Academic Achievement and Learning Outcomes in Mathematics among Secondary School Students in Nigeria

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In our march towards scientific and technological advancement, we need nothing short of good performance in mathematics at all levels of schooling. In an effort to achieve this, this study investigated the impact of motivation on students' school academic achievement in mathematics in secondary schools using motivation for academic preference scale ($\alpha = 0.82$) as a measuring instrument and achievement test in mathematics (ATM). Two hypotheses were tested for significant at 0.05 margin of error using t-test and analysis of variance (ANOVA). Results showed that gender difference were significant when impact of motivation on academic achievement was compared in male and female students. Also other result indicates significant difference when extent of motivation was taken as variable of interest on academic achievement in mathematics based on the degree of their motivation. Implications, suggestions and recommendations on students, parents, government, counsellors, educational stakeholders, etc were discussed.

Keywords: Motivation, Academic Achievement, Learning Outcome, Mathematics, Secondary School Students, Nigeria

INTRODUCTION AND BACKGROUND

In the contemporary Nigeria, greater emphasis is being placed on Industrial and Technological development. As a result students are being encouraged to take up science related subjects. One subject that cut across all the sciences is mathematics. Today, mathematical methods pervade literally every field of human endeavour and play a fundamental role in economic development of a country. In our march towards scientific and technological advancement, we

need nothing short of good performance in mathematics at all levels of schooling. Unfortunately performance of students in mathematics at the end of secondary education has not improved in the past decade (Umoinyang, 1999).

Various factors have been adduced for poor performance of students in mathematics. The interest of students in mathematics have been related to the volume of work completed, students task orientation and skill acquisition, students personality and self-concept (More, 1973), feeling of inadequacy (Callahan, 1971), motivation and self-confidence (Aiken, 1976), anxiety (Aiken, 1970), shortage of qualified mathematics teachers, (Ohuche 1978, Ale, 1989), poor facilities, equipment and instructional materials for effective teaching (Oshibodu, 1984, Akpan 1987, Odogwu, 1994), use of traditional chalk and talk methods, (Oshibodu, 1988, Edwards and Knight, 1994), large pupils to

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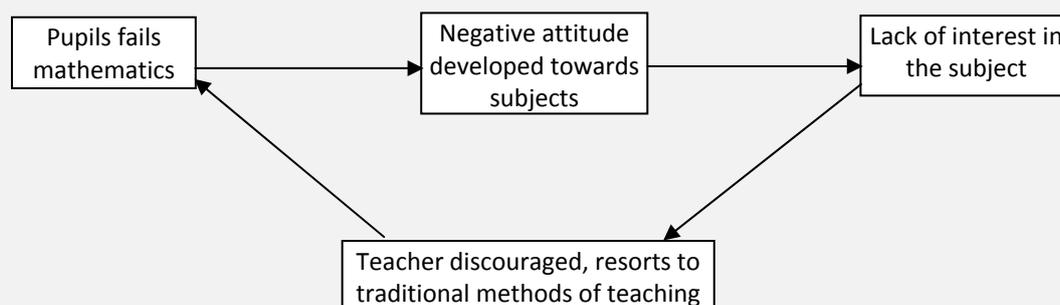


Figure 1. Illustration of factors affecting teaching and learning of Mathematics: Source- Aremu (1998)

teacher ratio (Alele-Williams 1988) mathematics fright/phobia (Georgewill, 1990) and so on. Wentzel (1998) stated that interest in activities tends to increase the likelihood that individuals formulate goals relating to that activity and invest time and effort to achieve them.

Moreover, individual characteristics such as intelligence, cognitive styles, and personality play an important role in learning and instruction as does the context of learning. Other research findings have shown that individual students' characteristics variables such as motivational orientations, self-esteem and learning approaches are important factors influencing academic achievements.

In the effort to improve students cognition and affective outcomes in mathematics and/or school learning, educational psychologists and mathematics educators, have continued to search for variables (personal and environmental) that could be manipulated in favour of academic gains. Of all the personal and psychological variables that have attracted researchers in this area of educational achievement, motivation seems to be gaining more popularity and leading other variables (Tella, 2003).

All the above stated reasons, for persistent failure in mathematics, which have been proffered, bear relevant in one way or the other to the poor performance of pupils in mathematics. This has led to a cycle of events that could be illustrated thus:

When explaining the illustration above (Aremu, 1998) explained that; when pupils express lack of interest in the subject, it affects the way they react or listen to the teacher. And when many of the pupils believe that they cannot pass, the teacher is also affected. This is because aside of this negative response from the pupils, he/she as well is already being confronted by a lot of other factors (e.g., low income, low status in society, large teacher-pupils ratio) and so on. These may cause him or her to resorts to the easiest way of disseminating knowledge that is 'chalk and talk' without the use of instructional materials. He may not also bother to vary his teaching styles to suit individuals; therefore the cycle goes on (Aremu 1998). One unfortunate outcome of this is that, the negative attitude

towards the subject is passed down from one generation of pupils to another and therefore the cycle keeps enlarging. What then could be done to break such a cycle of failure? This has been the question by many mathematics educators and researchers (Akpan 1987, Baya'a 1990). A lot of new and modified old methodologies have been proposed to improve performance in the subject (e.g., Ande, 1990; Akinsola, 1994; Broussard & Garrison, 2004) etc. Instructional materials have also been designed and developed to aid mathematics teaching and learning (Skemp 1989). All these are to help break this cycle of poor performance by motivating pupils to learn mathematics. This issued of motivating learners is seen as an important aspect of effective learning. In fact psychologists believe that motivation is a necessary ingredient for learning (Biehler and Snowman, 1986). They believe that satisfactory school learning is unlikely to take place in the absence of sufficient motivation to learn (Fontana 1981). The issue as relating to mathematics education would then be, is it possible to motivate pupils to learn mathematics? And how could it be done? One needs to therefore look at the effect of motivation on learning.

The issues of motivation of students in education and the impact on academic performance are considered as an important aspect of effective learning. However, a learner's reaction to education determines the extent to which he or she will go in education. The impact of motivation on education of mathematics of a child cannot be undermined. That is why Hall (1989) believes that there is a need to motivate pupils so as to arouse and sustain their interest in learning mathematics. "Motivation raises question on why people behave in the way they do it". An individual could therefore, from psychologists' point of view, be seen as politically, socially and academically motivated depending on the motive behind his or her activities.

Based on the foregoing, research on Mathematics academic achievement should be considered a continuous process until there is evidence of improvement in interest and performances of the learners in the subject particularly the secondary school students. Essentially therefore, the present study is an

effort in this direction. Hence the study investigates the impact of motivation on student's academic achievement in mathematics.

The Purpose of the Study

The study sought to explain learning outcomes in senior secondary mathematics in terms of motivating students towards academic gains in the subject.

Hypotheses

In this study, two null hypotheses were tested for significance level at 0.05 margin of error. They are:

H₀₁: There is no significant difference in the impact of motivation on academic performance of male and female students in mathematics.

H₀₂: There is no significant difference in the academic performance of highly motivated and lowly motivated students in mathematics achievement test.

The experimental researches carried out by some researchers have tremendously improved the knowledge about the motive to achieve (Gesinde, 2000). Achievement motivation could be seen as self-determination to succeed in whatever activities one engages in, be it academic work, professional work, sporting events, among others. Gesinde (2000) posits that the urge to achieve varies from one individual to the other, while for some individuals need for achievement is very high whereas for others it may be very low. However, there are high achievers and low achievers. What is responsible for the variation could be the fact that achievement motivation is believed to be learnt during socialization processes and learning experiences. As a matter of fact this varies from one individual to the other. Gesinde (2000) asserts further that, those who have high achievers as their models in their early life experience would develop the high need to achieve, while those who have low achievers as their models hardly develop the need to achieve.

Human beings are said to be extrinsically or intrinsically motivated. Intrinsic motivation is said to be derived internally in the job itself. It is that which occurs while a person is performing an activity in which he takes delight and satisfaction in doing. Intrinsic motivation is seen as internal reward, while extrinsic motivation is incentive or reward that a person can enjoy after he finishes his work.

Okoye (1983) opined that motivation holds the key to the understanding of human behaviour. According to him, motivation explains why one individual dodges work, another works normally satisfactorily enough to reach the height, while yet others resort to illegal and unconventional methods of achieving social, academic, economic and political recognition. He added that

motivation should be carefully manipulated whether in the work situation or study situation, so that our students are neither under motivated or over motivated but appropriately motivated so as to be useful to themselves in their society and the world at large.

Harju and Eppler (1997) investigated the relationships among college students' learning and performance goal orientation, drawing on questionnaire data from ages 17 – 22 of college students' total 312. It was reported that students who had a learning profile motivation had completed more semesters. They concluded that the younger students who were externally motivated tended to possess more irrational beliefs while other internally motivated students tended to be more involved in learning.

Cheung (1998) hypothesised that conceptions of success of achievement goal affect both the inclination to and actual performance. This was tested in a sample of 673 Chinese adolescents. Sex differences were found in the conception of success. As part of larger project concerned with motivation factors in educational attainment Siana et. al. (1998) focussing on Asian girls, 985 secondary schools students in London and England found that Asian students of both sexes rated parents and friends as more important in contributing to academic success.

Yoloye (1976) carried out a descriptive survey on the cause of poor academic achievement in Northern Nigeria. He reported that majority of the children who were labelled as backward or unintelligent to school were good, but they were handicapped by physical characteristics such as defective vision, learning defect and other preventable diseases. Bridgeman (1978) reported that standard school achievement test is somewhat predictive of later academic performance.

Bank and Finlapson (1980) found that successful students were found to have significantly higher motivation for achievement than unsuccessful students. Moreover, (Johnson, 1996; Broussard and Garrison, 2004; Skaalvik and Skaalvik, 2004; Skaalvik and Skaalvik, 2006; Sandra, 2002) revealed significant relationship between academic performance and motivation. In Nigeria, a study carried out by Ajayi (1998) on achievement motivation using 276 students revealed that there is an agreement between academic performance and motivation.

Motivation and Mathematics

In making instruction interesting in learning mathematics, there is need to use methods/strategies and material/media which will make the learning of mathematics, active, investigative and adventurous as much as possible. Such methods also must be ones that take into account, learner's differences and attitudes towards mathematics as a subject. Examples could be

the use of programmed learning texts, use of concrete materials and other instructional devices, which are manipulated. Also, mathematics exercises in form of various pencil and paper activities should be used.

To enhance self-esteem of learners, which will in turn improve attitude of such pupils, it is recommended that varying activities (game activities), which has been designed to contain mathematics problems ranging from easy to very difficult, should be used. At least each pupil no matter their ability level should be able to answer some questions correctly. This would go a long way to motivate such pupils towards further learning.

When an activity is designed with its central feature being an admired situation, experience or individual, it would go a long way in motivating, pupils to learn mathematics. For example, in teaching addition at the primary school level, you could centre learning activities around foods like snacks (for example, I got two sweets from mummy and four from daddy how many sweet do I have and so on). It could as well be centred on a pleasurable experience (like going to see father Chrisman) or around an admired person (for example, a most liked character on the television) and so on. All these suggestions would help to motivate learners towards learning. However, one strategy, which has been observed to bring about motivation of learners to learn mathematics, is the use of game based strategy (Aremu, 1998).

Achievement Motivation

How do people differ in their motivation to achieve? In a classic study to assess the differences in strengths of people's achievement motives McClelland and Colleague in Aire and Tella (2003) developed a projection technique using selected picture cards from the Thematic Apperception Test (TAT). The technique assumes that, when asked to write stories about the pictures, respondents will project their feelings about themselves onto the characters in the pictures. Assessment of the responses involves noting references to achievement goals (concern over reaching a standard of excellence). Subjects who refer to achievement goals are often rated high in achievement motivation; those who rarely or never refer to achievement goals are rated low.

Achievement motivation is often correlated with actual achievement behaviour (Camara, 1986). The motivation to achieve, however may evidence itself only in behaviour that children value. For example, a child may be highly motivated to achieve, and this may be exhibited in athletics but not in schoolwork. Thus, different situations have different achievement-attaining values for children (Eccles, et. al. 1998; Harter and Connell, 1984).

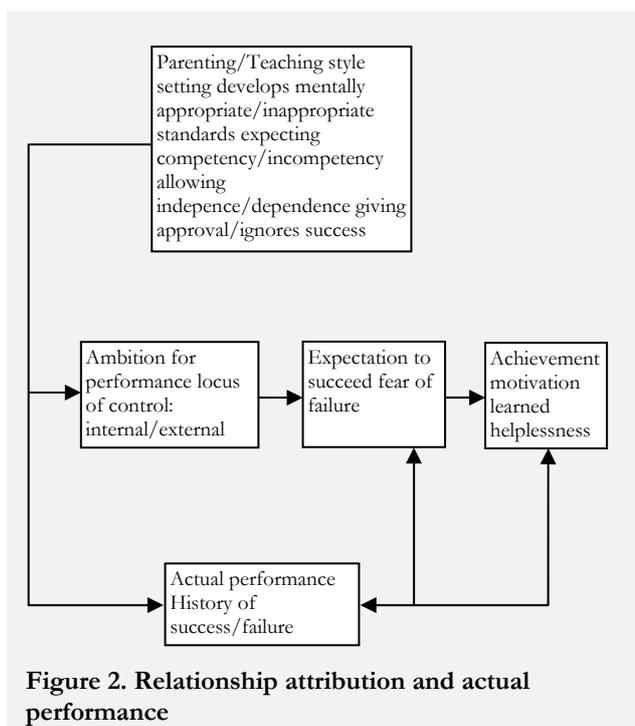


Figure 2. Relationship attribution and actual performance

Achievement Motivation, Child Expectations and Attributions

Individuals' actual achievement behaviour depends not only on their motivation to achieve but also on whether they expect to achieve and whether they fear failure. People are more likely to work hard when they perceive a reasonable chance to succeed than when they perceive a goal to be out of reach (Atkinson, 1964). Children's expectations of success can be measured by asking them to predict a certain grade, indicate how sure they are that they can solve a particular problem, and select the hardest task they think they can do from a collection of tasks varying by degree of difficulty (Philips, 1987).

Children with high expectation for success on a task usually persist at it longer and perform better than children with low expectations Eccles, 1983; Eccles et. al.1998). Researchers like (Carr et. al.1991) have found that children with high IQs and high expectations of success in school do, in facts get the highest grades. Children with high IQs and children with low IQs and low expectations receive lower grades than children with low IQs and high expectations. In addition to child rearing practices, reviewed previously, teaching styles and communication pattern affect children's attributions. When teachers are caring and supportive and emphasise the teaching learning process over the performance outcomes, and when they give feedback, children tend to be motivated to achieve and to expect success (Daniels, Kalkman, and McCombs, 2001).

METHODOLOGY

Design

This research is an ex-post facto design in the sense that the researcher does not have direct control over independent variables because their manifestations have already occurred or because they are inherently not manipulable. The investigator therefore examined the impact of motivation (independent variable) on secondary schools student achievement in Mathematics.

Population

The target population for the study comprised of all senior secondary 2 (SS2) students in Ibadan North-West and Ibadan South West Local Government areas of Oyo State of Nigeria.

Sampling Procedure and Sample

The study's participants were 450 secondary school students drawn from 10 schools in two local Governments areas in Ibadan. This sample of students was randomly drawn from selected secondary schools. Their age ranged from 15 – 22 years with a mean of 18.6 years and standard deviation of 3.6. The study includes male and female students. Other variables considered in the study are extent of motivation at two levels that is highly motivated and less motivated students.

Instrumentation

A modified instrument tagged Motivation for Academic Performance Questionnaire (MAPQ) was used to gathered data on the study. Items in the instrument were adapted from Motivation for Occupational Preference Scale (MOPS) by Bakare, (1977) and Motivation for Academic Study Scale by Osiki (2001). The instrument was divided into two parts. The first part require the participants demographic information like sex, age, class, name of school etc; while the second part contain the items. It was a thirty items scale of likert type format with

response ranged from strongly agrees 5, to strongly disagree 1. To ascertain the reliability of the instrument after modification, it was administered on 50 respondents who were secondary school students selected from another two secondary schools which were not part of the study sample. The reliability coefficient yielded an $r = 0.85$ through cronbach alpha. All the items in the instrument were really very relevant to the content of the study.

Data on academic performance were gathered through achievement test in mathematics constructed by the researcher in the subject content area. The reliability coefficient of the instrument was found to be 0.82 using test re-test reliability method of two weeks interval.

Data Collection Procedure

All the 450 participants were administered the Motivation for Academic Performance Questionnaire. The mathematics teachers in the participating schools assisted during the administration of the instruments. Instruction on how to respond to the questionnaire was read to the participants. This ensures its proper filling. Data collection was done immediately after the administration and all the response sheets were retrieved from the respondents. Out of 480 questionnaires administered, 450 were valid for the analysis on the study.

Data Analysis and Results

Data collected on the study were analysed using inferential statistics which includes; student t-test and analysis of variance (ANOVA).

Specifically, the study provided answers to two research hypotheses. The sequence of the presentation of the results is in accordance with that of the hypotheses. In this study, two null hypotheses were tested for significance level at 0.05 margin of error. The results of the study were presented in tables below.

H_{01} states that there is no significant difference in the academic achievement of male and female students in mathematics. The result of the above hypothesis (H_{01}) is presented in table 1 below:

Table 1: t-Test showing the Mean difference in the Impact of Motivation on Academic Achievement of Male and Female Students in Mathematics

Gender	N	X	S.D	Df	t-cal	t-crit.	Decision
Male	260	48.3	18.2				
Female	190	33.4	13.6	448	9.4	1.96	S*

S* - Significant at 0.05 probability level.

Table 2. t-test Showing Mean Difference Summary of Academic Achievement of Highly Motivated and Lowly Motivated Students in Mathematics.

Variables	N	X	S.D	Df	t-cal	t-crit.	Decision
Highly motivated students	150	39.3	25.8	448	8.05	1.96	S*
Lowly motivated students	300	10.3	7.8				

S* - Significant at 0.05 significant level.

Table 3. ANOVA Source Table of Summary of Gender Difference and Academic Achievement in Mathematics.

Source of variation	SS	Df	Ms	F-ratio	F-critical
Between	271174	1	90391	23.01	3.84
Within	15555	448	39.28		
Total	286729	449			S*

S* - Significant at 0.05 probability margin

Table 1 presents the results of the analysis conducted on the impact of motivation on academic achievement in mathematics based on gender. The result clearly reveals that significant difference exists in the academic achievement of male and a female student in mathematics with (t.cal.=9.4; t.crit.1.96; df=448; at 0.05 level), which means hypothesis (H_{01}), is rejected.

The Table 2 shows academic achievement measured along side extent of motivation. The result reveals that there is significant difference in the academic achievement of highly motivated and lowly motivated students in mathematics with (t.cal.=8.05; t.crit.=1.96; df=449 and at 0.05 level).

The calculated f-ratio at (1,448) is 23.01, which shows a significant difference on gender and academic achievement as clearly stated in the table 3.

DISCUSSION, SUGGESTION AND RECOMMENDATION

The result of the first hypothesis, which compares the impact of motivation on academic achievement of secondary school students in mathematics using gender as a variable of interest is found to be significant. The findings show that motivation has impact on academic achievement of secondary school students in mathematics with respect to gender. This finding is in disagreement with Siana et. al. (1998) findings that Asian students of both sexes rated parents and friends as more important in contributing to academic success. The variation in the present result on this study and that of Siana et al., (1998) may be connected with the issue of environment. While the present study was conducted in Nigeria, Africa; the other was conducted in Asia.

Meanwhile, one thing that should be very clear is the fact that success in school subject or academic generally depend on many motivating factors. The issue of gender is part of it likewise parental involvement/support and or peer influence. All these should not be underrated because they are factor that can make or mar student achievement in school.

The result of the second hypothesis shows that secondary school students differ significantly in their academic achievement based on the extent to which they are motivated. The results reveal that highly motivated students perform better academically than the lowly motivated students. This finding corroborates that of Bank and Finlapson's (1980) finding who stressed that successful students have significant higher motivation for achievement than unsuccessful students. Similarly, the report by John (1996) that academic achievement is highly correlated with student's motivation lends a good support to the present findings. With reference to the position of (Ayotola, 1998), that when pupils express lack of interest in the subject, it affects the way they react or listen to the teacher. It can be said therefore that interest and attitude of learner towards a particular subject matters a lot. This is because these two constructs according to the author are high motivating factor which can lead to better achievement on the part of the learner. Good attitude and better interest learners display particularly in Mathematics serve as an encouragement even to the teacher. And this can help the teacher a lot to disseminate his teaching to the best of his ability and knowledge making use of all available resources rather than resorting to the use of chalk and talk when learners show no interest or negative attitude. Moreover, when

the students display good attitude and better interest in Mathematics, the teacher is motivated and this may cause him to forget whatever hindrances to the teaching of the subject from his own part. Good impartation of Mathematics knowledge on the part of the teacher; couple with student's interest in the subject and the display of positive attitude as earlier pointed out, are good motivating **factors** which when combine together is assumed will result to better achievement in Mathematics.

Suggestions

From all views, discussed in the literature review, some of the suggestions use can bring out as ways of motivating students to learn are:

- * make mathematics teaching interesting.
- * Individual differences in ability, background and attitude must be taken into consideration.
- * enhance learners feeling of esteem by arranging varieties of learning experiences according to Biehler and Snowman (1986);

“Try to send your students away from your instruction anxious to use what they have been taught and eager to learn more by associating subjects with liked and admired situations, things or individuals and also arranging conditions so that students feel comfortable when in the presence of a subject”.

All these suggestion must however be transformed into actual practice within the framework of the school curriculum. More especially, with the case of mathematics education, these suggestions could be guidelines in deciding the types of methods/strategies or instructional materials/media, which could be used in motivating pupils to learn mathematics.

Implications and Recommendations

The findings reported in this study justify the importance of motivation to academic performance. The findings have implications for the teachers of mathematics that they should try as much as they could to motivate their students during the course of instructions. The parents as well as the government should engage in programmes that can motivate the students to improve their academic performance. It is therefore, hoped that these findings will serve as resource materials for mathematics educators, mathematicians, school authorities psychologists, counsellors, government, parents and significant others who are concerned with the academic progress of the students.

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