

Assessment of Mathematics Attitude, Test-taking Skills and Mathematics Anxiety of Secondary School Students in Ondo State

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Abstract

Mathematics is very important for skill acquisition and sustainable national development since it laid solid foundations for science and technology. Despite its practical utility, the performance of secondary school students in the subject is not encouraging. Test taking skills, mathematics anxiety and poor attitude towards mathematics have been identified in literature as some of the factors contributing to students' poor achievement in the subject. This study therefore assessed Mathematics attitude, test-taking skills and Mathematics anxiety of Secondary School Students in Ondo State. Descriptive survey research design was used for the study. Three hundred and sixty (360) SS3 students randomly selected using multistage random sampling procedure constituted the sample. Three self-constructed instruments were used for data collection. The instruments are: Test-taking Skills Scale (TTSS); Mathematics Anxiety Scale (MAS) and Students' Attitude towards Mathematics Scale (SAMS). Cronbach alpha was used to measure the internal consistency of the instruments. The reliability coefficients for the three measures are: 0.88, 0.79 and 0.73 respectively. Data collected were analyzed using frequency counts, percentage, mean and standard deviation. Findings revealed that majority of the secondary school students in Ondo state have negative attitude towards the study of mathematics, manifest high level of mathematics anxiety and do not have appropriate test-taking skills. It was concluded that secondary school students in Ondo State are still having problems with the identified variables causing poor performance in mathematics. Appropriate recommendations were also made to improve students' achievement in the subject.

Keywords: *Assessment, Mathematics Attitude, Test-Taking Skills, Mathematics Anxiety, Sustainable Development*

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Introduction

Mathematics is very important in the development of any society. It is a subject that cut across all spheres of human endeavour. Roger Bacon in Yadav (2019) stated “Neglect of mathematics works injury to all knowledge, since he who is ignorant of it cannot know the other sciences or the things of the world. According to Yadav (2019), Mathematics plays significant roles in social development, intellectual development, vocational development, moral development, spiritual development, cultural development, development of education system, development of economics, development, women empowerment, development of medical and agricultural field, and development of science and technology. Mathematics is the foundation of science and technology and its functional role to science and technology is multifaceted and multifarious that no area of science, technology and business enterprise escapes its application (Okigbo & Osuafor; 2020).

Most countries of the world accord much importance to the study of mathematics because it is seen as a key tool for political, social, scientific and technological growths, as well as a basis for scientific and technology understanding (Adero, 2014). This shows that mathematics as a subject occupies a significant unique position in the science curriculum. Mathematics is a prerequisite course in the study of Engineering, Computer science and other allied science courses. Mathematics plays a key role in the sharpening of how an individual deals with the various spheres of private, social and civil life (Mohd, 2011). This justifies the main reason why mathematics is made a compulsory subject in Primary and secondary school curriculum in Nigeria. It also serves as a pre-requisite for gaining admission to tertiary institutions in Nigeria.

Despite the importance of mathematics, the performance of the students in the subject at the external examinations in Nigeria and Ondo State in particular is not encouraging (Popoola & Olarewaju, 2010., Idowu, 2016; Imoko & Jimin, 2016., Oni, 2021). Mathematics attitude is one of the major factors that contributed to students’ poor achievement in mathematics. Attitude could simply be defined as the individual’s disposition to things, objects or people. Davadas and Lay (2017) defined attitude as a learned predilection of a person to react positively or negatively to any object, situation, concept and another person. The attitude of students toward mathematics has been the subject of a great deal of attention from educators. Students with a positive attitude toward mathematics tend to enjoy the subject, understand its value, and have confidence in it; thus, they are likely to prioritize the study of mathematics (Kiwauka, Van Damme, Van den Noortgate, & Reynolds, 2020; Mullis, Martin, Foy, Kelly, & Fishbein, 2020), which could lead to high performance in the subject. Although several researchers have reported a positive relationship between students’ attitudes toward mathematics and

mathematics achievement (Chen et al, 2018; Dowker, Cheriton, Horton, & Mark, 2019; Sunghwan & Taekwon, 2021), others have reported a non-significant association between them (Mubeen, Saeed, & Arif, 2013).

Zan and (2007) identify three dimensions within attitudes towards mathematics: emotional disposition, vision of mathematics and perceived competence. This connotes that mathematics attitude is a feeling of like or dislike for mathematics (Zan & Martino, 2007). Mathematics attitude can either be positive or negative. Positive mathematics attitude enables the students to be focused on mathematics computations and problem solving, negative attitude diverts the students mind from concentrating on mathematics computation and solving problem, they view mathematics as challenging. Attitude formed by students at foundation and secondary school stage, will go a long way in determining their intention to study mathematics and mathematical related courses in higher education in future (Ayodele, 2016; Yasar, 2016).

Bakare in Asikhia (2010) categorized factors causing poor academic performance of students in mathematics to four areas which are: Home or family related factors such as cognition stimulation during the first two years, types of discipline at home, lack of role model and finance; School related factors such as school location and physical building, interpersonal relationships among the school personnel, lack of Internet in the school program; Child related factors such as basic / cognitive skills, physical and health factors, psycho-emotional factors; and society related factors such as inability of educational policy, underfunding of educational sectors, leadership and job losses.

In addition to the aforementioned factors, some test related factors too can as well influence students' performance in mathematics. The most common test related factors that have significant impact on students academic performance according to Hemberton, Swaminathan and Rogers in Dodeen (2009) include test anxiety, test taking skills, tendency to guess, attitude towards test and cheating.

Test taking skills are cognitive skills that allow students to understand any test taking situation in an appropriate manner, and to know what to do before, during and after the test (Dodeen, 2009). Most test taking skills are useful in students' practical life, where they may benefit their effective use of time, ability to set priorities, ability to work both fast and accurately and to make sure ideas become directly evident. Test taking skills are related to the motivation to learn and to the attitudes students may hold with regards to specific subjects (Dodeen, 2009). Further studies indicated that students with test taking skills improved attitudes towards tests, demonstrated lower levels of anxiety and achieved

better results (Peng, 2005). Gbore and Osakuade (2016) attest to it that the quality of test taking skills possessed by a testee at a particular time, allows him/her to obtain a higher score in a test. Takallon, Vahda, Araghi & Tabrizi (2015) carried out their research to investigate if training on test taking strategies could improve performance. At the end of the investigation, it was observed that those given training on test taking skills performed better than those given placebo treatment.

Mathematics anxiety is another test related factor that can affect students' performance in mathematics. Anxiety as a global construct has been operationally defined in various ways by notable scholars. Anxiety simply is a summary description of a series of overt and covert actions.

Mathematics anxiety is associated with panic, nervousness, restlessness, helplessness, trembling and confusion that arises in students when mathematics or mathematics tests are mentioned (Okolo, 2015). These could be as a result of students' lack of interest, unpreparedness for tests and past unpleasant experiences related to test and test results.

Statement of the Problem

Mathematics is very important to social and economic development of any nation. The poor performance of students in the subject at Senior Schools Certificate Examination (SSCE) is causing a sort of worry among education stakeholders in Nigeria. If the consistent under achievement of students in the subject should continue unabated, it could spell doom for the technological advancement of the country. Attitude towards mathematics is one of the major determinants of the students' performance in mathematics. A negative attitude towards mathematics has been found to be a contributing factor towards under achievement of students in the subject. Also, Mathematics anxiety and test-taking skills of students have also contributed to poor performance of students in the subject. Most of the past researchers were focused on relationships of mathematics attitude, Mathematics anxiety and test-taking skills to students' academic performance in mathematics but the study to really assess the level of mathematics anxiety. Mathematics attitude and test-taking skills of secondary school students in Ondo State seem not available; therefore there is the need for the study to assess students on these variables in order to improve students' performance in mathematics.

Purpose of the Study

The main purpose of this study is to assess factors influencing mathematics performance of secondary school students in Ondo state. Specifically, the study intends to assess:

1. students' attitudes towards mathematics.
2. mathematics' anxiety of students.

3. the test-taking skills of students.

Research Questions

The following questions are generated to guide the study

1. What is the attitude of students towards mathematics?
2. What is the test-taking skill of the students?
3. What is the mathematics anxiety level of the students?

Methodology

Descriptive survey research design was adopted in carrying out the study. This descriptive survey research design is appropriate for this study because it affords the researcher to obtain the opinions of a representative sample of a target population (senior secondary school students in Ondo state) on a specific topic of interest (test taking skills, mathematics anxiety and attitude towards Mathematics of students) so as to infer the perception or views to the entire population. The entire public senior secondary school students in all the three Senatorial Districts of Ondo State constituted the population for this study. A sample of three hundred and sixty (360) Senior Secondary School class three (SSS3) students constituted the sample. The sample was chosen from the population using multistage and simple random sampling procedures. Ondo state is divided into three senatorial districts (that is Ondo North, Ondo Central and Ondo South senatorial districts). Each senatorial district has local government area councils. In stage 1, simple random sampling technique was used to select one local government area from each of the three senatorial districts. In stage 2, simple random sampling technique was also used to select two schools from each of the selected local government area councils. In the final stage, sixty students (30 males and 30 females) were randomly selected from each of the selected schools.

Three self-constructed instruments were used for data collection. The instruments are: Test-taking Skills Scale (TTSS); Mathematics Anxiety Scale (MAS) and Students' Attitude towards Mathematics Scale (SAMS). The three instruments have 15 items each structured on 4-point scale of Strongly Agree, Agree, Disagree and Strongly Disagree. Convergent validity was used to ascertain the validity of the three instruments. The instruments were administered on 20 non-participating students concurrently with three standardized instruments (Test-Taking Skills Scale by Dodeen, 2008; MAS-R developed by Bai, Wang, Par & Frey, 2009; and MAI developed by Ahmad, 1986). Data collected were subjected to Pearson Product Moment Correlation, correlation coefficients of 0.78, 0.82 and 0.75 were obtained respectively for Test-taking Skills Scale; Mathematics Anxiety Scale and Students'

Attitude towards Mathematics Scale. Cronbach Alpha was also used to ascertain the reliability of the instruments. After pilot testing, the reliability coefficients of 0.88, 0.79 and 0.73 were obtained respectively for Test-taking Skills Scale; Mathematics Anxiety Scale and Students' Attitude towards Mathematics Scale. The three instruments were administered by the researcher with the help of research assistants. Descriptive statistics such as simple frequency counts, percentage, mean and standard deviation were used to analyze the data.

Results

Research Question 1: What is the attitude of students towards mathematics?

In order to answer this research question, data obtained from Students' Attitude towards Mathematics Scale was analyzed using frequency counts and percentage. The result is as shown in Table 1.

Table 1: Students' attitude towards mathematics

Intervals	Attitude	Frequency	Percentage
15 – 30	Negative	192	53.3%
31 – 60	Positive	168	46.7%
Total		360	100%

From table 1, 192(53.3%) of the secondary school students have negative attitudes towards mathematics while 168(46.7%) of the secondary school students have positive attitudes towards mathematics. it can be concluded therefore that majority of the secondary school students in Ondo state have negative attitude towards the study of mathematics.

Research Question 2: What are the test-taking skills of secondary school students?

In order to answer this research question, data obtained from students' responses to Test-taking skills scale which consisted the following subscales (Before test taking skills, 4 items; Time management skills, 4 items; During test skills, 4 items and After test skills, 3 items) were subjected to mean and standard deviation. The result is as shown in Table 2.

Table 2: Students test-taking skills

Subscale	No of items	Mean	SD	Remark
Before test skills	4	2.27	0.22	Not Appropriate
Time management skills	4	2.43	0.35	Not Appropriate
During test skills	4	1.97	0.43	Not Appropriate
After test skills	3	2.40	0.39	Not Appropriate

Total	15			
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From table 2, it can be observed that students' test taking skills are below the mean cut off point of 2.5 which is the minimum cut off point for 4 points likert scale in all the 4 sub-scales. This means that the students do not have appropriate test-taking skills before the test (\bar{X} = 2.27, SD = 0.22); time management (\bar{X} = 2.43, SD = 0.35); during test (\bar{X} = 1.97, SD = 0.43) and after the test (\bar{X} = 2.40, SD = 0.39).

Research Question 3: What is the mathematics anxiety level of secondary school students?

In order to answer this research question, data obtained from mathematics Anxiety scale were subjected to mean and standard deviation. Since the minimum obtainable mark is 15 and maximum is 60, mean plus or minus 1 standard deviation were employed to classify the students into high, moderate and low mathematics anxiety level. The result is as shown in Table 3.

Table 3: Students level of mathematics anxiety

Intervals	Mathematics Anxiety level	Number of students	Percentage
42 – 60	High	167	46.4%
38 – 41	Moderate	117	32.5%
15 - 37	Low	76	21.1%
		360	

From table 3, 167 (46.4%) students have high mathematics anxiety, 117 (32.5%) students have moderate level of mathematics anxiety, while 76 (21.1%) students have low mathematics anxiety. It can be concluded that majority of the secondary school students in Ondo State demonstrated high level of mathematics anxiety.

Discussion of Findings

Finding from research question 1 showed that majority of the secondary school students in Ondo state have negative attitude towards the study of mathematics. This study corroborates the finding of Agah and Thankgod (2022) who revealed that the attitude of students in Mathematics were mostly negative. The similarity in the findings of the study is not coming as a surprise. Mathematics is a subject that most people do not like, they will definitely develop hatred.

Finding from research question 2 showed that secondary school students in Ondo State do not have appropriate test-taking skills before the test, time management, during test and after the test. This study is at variance with the early study of Dodeen (2009) whose study revealed that university

students generally have good skills in taking test. The reason for the variance could be that this present study was conducted among secondary school students while Dodeen study was conducted among undergraduate students. At university stage, students must have gathered additional experience on test taking strategies.

Finding from research question 3 showed that majority of the secondary school students in Ondo State demonstrated high level of mathematics anxiety. This finding corroborates the finding of Mutegi, Gitonga and Rugano (2021) whose study revealed that majority of secondary school students in Kenya had high level of mathematics anxiety; the similarity in the two studies could be that secondary school stage is a stage where mathematics is a must for every student to pass before gaining admission for further studies.

Conclusion

Based on the findings of this study, it can be concluded that majority of secondary school students in Ondo State have negative attitude towards mathematics. The students do not have appropriate test-taking skills before the test; time management; during test and after the test. Majority of the students manifest high mathematics anxiety.

Recommendations

Based on the findings and conclusion of this study, the following recommendations are made;

1. teachers and counsellors should train students on test-taking skills
2. Mathematics teachers should employ different teaching methods to arouse the interest of the learners so as to develop positive attitude
3. Psycho-educational intervention should be put in place by school counsellors to make students develop moderate level of mathematics anxiety

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