

Impact of Test-Taking Skills in Mathematics on Adolescents Academic Performance in Lagos, Nigeria: Assessment and Sociological Implications

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Abstract

One of the ways to prepare students for both internal and external examinations is constant exposure to test-taking skills. The rationale behind test-taking is to build students' courage prior to examination period especially in mathematics where many students perform below expectations. Of course, several factors could be responsible for students' poor performances but one of effective approach to eliminate this poor performance is to prepare students' mind towards test-taking. Hence, the study was carried out to examine the impact of test-taking skills in Mathematics on adolescents' academic performance in Lagos Mainland Local Government Area of Lagos State. The study was a descriptive research survey. Three (3) null hypotheses were tested at 0.05 level of significance in the study. The population for the study were all senior secondary students in Lagos Mainland Local Government Area of Lagos-State. A self-developed questionnaire titled Use of Test-Taking Strategy, Test Anxiety Attitude and Motivation towards Mathematics Learning Questionnaire (UTTSTAAMML) and a mathematics Achievement Test (MAT) were used as instruments for data collection. The instruments had reliability coefficients of 0.58 and 0.64 respectively when tested during the pilot study. The study revealed that the use of test-taking skills in mathematics significantly impact on adolescents' level of test anxiety, motivation, attitude and academic performance. It was therefore concluded among others that test-taking skills remain a viable tool in adjusting students' perception towards mathematics. This study among others therefore recommends that the school authorities should organize capacity building trainings and programmes which should be effective on student's test-taking skills and orientating their mathematics teacher on the expected skills as this will improve student's skills in mathematics tests.

Keywords:

Test-taking skill,
Motivation, Attitude
academic
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Background to the Study

The idea of test or testing is one of the most important parameters by which a society like Nigeria assesses the product of her educational system. Testing is the most unbiased process of decision-making in schools, industries and government establishments as it is now used for admission, recruitment, promotion, placement, evaluation, guidance, research and teaching purpose among others in modern societies (Emaikwu, 2011). Ilogu (2005) regarded test as a tool that is dynamically employed to pull together relevant information about students' attributes. Okoli (2005) defined "test" as a set of correctly constructed questions administered to person(s) for the purpose of tracking down numeric evidence(s) about several characteristics of the behaviour of the person(s) in reference.

Considering its varieties, Ukwuije (2012) opined tests can come in types and in forms; however, noting that each of these types can be explained under any of the forms. The test types include Teacher-made Achievement test, Standardized Achievement test, Aptitude test, and Intelligence test; the test forms could be oral test, practical test, written test (which includes Closed-Book test, Open-Book test, Pre-Published test, Open Time or Take Home test, Project Work and *e*-test). However, recently, Alade and Igbinosa (2014) aerated their own views on the classification of test forms, while inferring that test could be in form of Essay items (which could be extended or restricted type) and Objective items. They noted that the objective test items also be regarded as supply test type or selection test type could be categorized as Alternate response item (true-false item), Matching item, and Multiple-choice item.

In spite of all these heralded delineation and relevance of tests, it has been conceived that almost every society in the world is groping with raising the level of academic performance of their school students and minimize the challenge of poor performance. This observed challenge could be tantamount to the students' deficiency in possessing test-taking skills that are germane to their academic success in any school subjects, besides, many school teachers may be oblivious of existence of such test-taking skills which the students ought to be taught.

Test-taking skills are cognitive skills that allow students to undertake any test-taking situation in an appropriate manner, and to know what to do before, during, and after the test (Dodeen, 2009). Elucidating, Sefcik, Bice and Prerost (2013) hinted that test-taking skills are transferable skills, where once acquired, students may be enabled to use these skills across a variety of subjects and within different settings and conditions. Unanimously, they noted that 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.

Austin, Partridge, Bitner and Wadlington (1995) in Dodeen, Abdelfattah and Alshumrani (2014) noted that test-taking skills can be effectively used to help examinees (i.e. secondary school students) to eliminate any feelings of tension and anxiety that may

interfere with their ability to communicate what they know in a test situation. By way of explanation, Dodeen, Abdelfattah and Alshumrani (2014) noted that possessing test-taking skills could also spring students' motivation to learn any school subject (i.e. mathematics), boost their affection or attitude, not only towards learning mathematics, but also towards being tested in the subject.

Dodeen (2015) opined that, students with test-taking strategies are noticeable with: Improved attitudes towards tests; lower levels of test anxiety and achieve better. Dodeen (2008) cited in Khosravani, Zanjani, and Najafabadi (2017) reveals that test-taking skills is advantageous in ensuring test validity and test reliability. Al Fraidan and Al-Khalaf (2012) concluded that there are two main advantages of using test-taking skills/strategies: These are:

1. The primary advantage of test-taking skills is an improvement in test-scores.
2. Secondly, the advantage is a reduction of exam-related anxiety and a reinforcement of students' confidence about examinations.

Other advantages cited by Al Fraidan and Al-Khalaf (2012) include but not limited to:

1. Once test constructors have knowledge of test-takers' strategies, they can make more informed choices in the construction of test items, including choices that, ideally, will better assess the test-takers' language skills, rather than their cleverness at circumventing an assessment of these skills.
2. Collecting data on test-taking skills/strategies helps to determine the extent to which performance on a given assessment measure is reflective of knowledge and performance in the area assessed.

As for Sefcik, Bice and Prerost (2013), test-taking skills are useful in a 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.

To Dodeen (2015), taking many tests in life does not guarantee the achievement of skills or strategies to deal with any testing situation in appropriate manner. These strategies can be achieved by teaching them in a systematic manner, exactly as the case with any other discipline. Moreover, because these strategies are transferable strategies and affect achievement on all other subjects, there is a need to give more time and training in teaching these strategies so students will have enough opportunities to learn and practice them. Dodeen (2015) further stated that it is unfortunate to discover that teaching such strategies or skills is usually ignored in schools in general and particularly at the elementary level where these strategies are best to be taught. The best thing that happens in some schools in this regard is providing students with some instructions or guidelines about how and what to do in tests especially before or during the final exams. Definitely, this is not enough for students to achieve and apply these strategies. It is against this backdrop that this study evaluates test-taking skills in mathematics impact on adolescent's academic performance in Lagos Mainland Local Government Area.

Statement of the Problem

Feelings of tension, anxiety and resentment towards the subject called mathematics and any of its test formats are the usual facial expressions on many students. This could be due to the fact that after taking any mathematics test, some students discovered that they could not attempt the required number of test items. By way of reflection, they found out that though the unattempted test items might be moderately simple enough to be answered, yet they could not attempt them. No doubts, this might be because they are not aware of some pertinent test-taking skills in mathematics which could assist them in obtaining at least an average score in any mathematics test.

Such foretasted usual facial expression could also be due to the fact that mathematics teachers do not inculcate (while teaching) in their student's specific methods of solutions to be used depending on the type of test given. Many mathematics teachers do not let their students understand that there are some methods of solution that are only good enough for objective test-type, while some other methods of solution are only good for theory-based test types.

Little wonder, the helpless situation of these school students has resulted into recurring low level of performance in mathematics, hence many schools in spite of the fact that they have academically qualified teachers still grope with the challenge of raising the academic performance of the students over the years especially in mathematics. It is on this backdrop that this study examined test-taking skills in mathematics impact on adolescent's academic performance in Lagos Mainland Local Government Area.

Objectives of the Study

Generally, the study aims to examine the impact of test-taking skills in Mathematics on academic performance of adolescents in Lagos Mainland Local Government Area of Lagos State, Nigeria. Specifically, the study ascertained:

1. The extent to which the use of test-taking skills in Mathematics impact on adolescents' level of test anxiety and academic performance.
2. The extent to which the use of test-taking skills in Mathematics impact on adolescents' motivation and academic performance.
3. The extent to which the use of test-taking skills in Mathematics impact on adolescents' attitude and academic performance.

Research Hypotheses

The research tested the following hypotheses:

1. There is no significant impact of use of test-taking skills in Mathematics on adolescents' level of test anxiety and academic performance.
2. There is no significant impact of use of test-taking skills in Mathematics on adolescents' motivation and academic performance.
3. There is no significant impact of use of test-taking skills in Mathematics on adolescents' attitude and academic performance.

Research Design

The descriptive survey research method was adopted in carrying out the study. Descriptive research was used to obtain information concerning the current status of phenomena (i.e. impact) of test taking skills/strategies in Mathematics among adolescents) in order to describe "what exists" with respect to variables i.e. use of test-taking strategies, level of test anxiety, attitude as well as motivation towards learning mathematics (Osuala, 2001). More so, Best (1981) explained that descriptive survey research design is a research method which enables the researcher to obtain the opinions of a representative sample of a target population (i.e. senior secondary school students) on a specific topic of interest (i.e. impact of test taking skills in Mathematics among adolescents) so as to infer the perception or views of the entire population.

Population of the Study

The target population for this study is the Senior Secondary Two (S.S.2) students from government-owned schools within Lagos Mainland Zone Local Government Area of Lagos State. The estimated senior secondary students' population for this is 32,899 out of which 11,446 are Senior Secondary Two (2) students, (Lagos Eko Project, 2012).

Sample and Sampling Technique

The researcher employed simple random technique to select four (4) public secondary schools and 200 participants. The sampling technique involved using simple random sampling to select (4) senior secondary schools in Lagos Mainland Area of Lagos State. Afterwards, simple random sampling was also being used to select fifty (50) students in each of the school, giving a total of 200 students used as the study sample.

Research Instruments

Two research instruments (i.e. students' Questionnaire, and a Mathematics Achievement Test for students) were used in data collection. The questionnaire was titled as UTTSTAAMML Questionnaire (Use of Test-Taking Strategy Test Anxiety Attitude and Motivation towards Mathematics Learning).

The second instrument (i.e. mathematics Achievement Test) which measures the students' academic performance, a twenty (20)-item test was constructed in form of multiple-choice test. It is worthy to note that the items in the Mathematics Achievement Test (MAT) were selected from the past question papers of West African Examination Council (2011-2017), although some modifications were made to the items.

Results

Descriptive Analysis of Data

Table 1: Distribution of Students into School A & B

Name of Schools	Number of Students	Percentage (%)
School A	50	26
School B	47	23.5
School C	49	24.5
School D	50	26
Total	196	100.0
Gender	Number of Students	Percentage (%)
Males	92	46.9
Females	103	52.6
Unidentified Respondents	1	0.5
Total	196	100.0
Age Groups	Number of Students	Percentage (%)
12 years	1	0.5
12-14 years	41	20.9
15-17 years	121	61.7
18-20 years	33	16.8
Total	196	100.0
Class Types	Number of Students	Percentage (%)
Sciences	107	54.6
Arts	33	16.8
Commercial	56	28.6
Total	196	100.0

Table 1 informs that from the one hundred and ninety-six (196) students' responses obtained, 50 (26%) were students of School A, 47 (23.5%) were students of school B, forty-nine (24.5%) were from school C while the remaining 50 (26%) were from School D. Also, the table informs that from the one hundred and ninety-six (196) students' responses obtained, 92 (46.9%) were males, 103 (52.6%) were females, while only 1 (0.5%) did not identify his/her gender. Therefore, female students are majority of the respondents. The table further reveals that from the entire 196 students that responded to the research instruments, majority (121, 61.7%) were between the ages 15 to 17 years, this was followed by students within ages 12-14 years (41, 20.9%), and then those that were between 18-20 years (33, 16.8%) while only (1, 0.5%) of respondent is 12 years. In addendum, the table reveals that from the whole of 196 students that responded to the research instrument, only (33, 16.8%) are in Arts class, another (56, 28.6%) are in Commercial class while majority of these respondents (107, 54.6%) are science students.

Hypothesis 1: There is no significant impact of use of test-taking skills in Mathematics on adolescents' level of test anxiety and academic performance.

Table 2: ANOVA on the Use of Test-Taking Skills in Mathematics on Adolescents' Level of Test Anxiety and Academic Performance

	Sum of Squares	DF	Mean Square	F	F critical	Sig.
Between groups	9.99	2	1.99	2.09	1.07	0.001
Within groups	282.27	194	1.46			
Total	292.26	196				

F2.09= 1.07 <0.001

Results of the ANOVA and descriptive mean statistics showed that significant relationship exist in the use of test-taking skills in Mathematics and adolescents' level of test anxiety and academic performance. Reasons being that in the ANOVA statistics, the calculated p value of 0.001 was found to be lower than the level of significant 0.05 (*Statistical benchmark*) while the calculated F ratio value of 2.09 was found to be higher than the F critical 1.07. Also, in the descriptive statistics, the responses on average (mean) use of test-taking skills and level of test anxiety by female was higher than their male counterparts, thus on a general note, the students test-taking skills was below their level of test anxiety (from a 20-item achievement test scored dichotomously). By implication, the null hypothesis which states that there is no significant impact of use of test-taking skills on adolescents' level of test anxiety is hereby rejected. Hence, the use of test-taking skills significantly impact on adolescents' level of test anxiety.

Hypothesis 2: There is no significant impact of use of test-taking skills in Mathematics on adolescents' motivation and academic performance.

Table 3: ANOVA on the Use of Test-Taking Skills in Mathematics on Adolescents' Motivation and Academic Performance

	Sum of Squares	DF	Mean Square	F	F critical	Sig.
Between groups	20.55	2	10.28	4.76	3.91	0.05
Within groups	500.52	194	2.58			
Total	521.0	196				

F4.76= 3.91 <0.046

Results of the ANOVA and descriptive mean statistics revealed that significant relationship exist in use of test-taking skills in Mathematics and adolescents' motivation and academic performance. Based on the ANOVA statistics, the calculated p value of 0.05 was found to be lower than the level of significant 0.05 (*Statistical benchmark*) whereas the

calculated F ratio value of 4.76 was found to be higher than the F critical 3.91. In addendum, descriptive statistics responses on average (mean) indicated that use of test-taking skills and adolescents' motivation towards learning mathematics by female was higher than their male counterparts (from a 20-item mathematics achievement test), by implication, the students test-taking skills was below their motivation towards learning mathematics. Therefore, the null hypothesis which states that there is no significant impact of use of test-taking skills on adolescents' motivation towards learning mathematics is hereby rejected. Thus, use of test-taking skills significantly impact on adolescents' motivation towards learning mathematics.

Hypothesis 3: There is no significant impact of use of test-taking skills in Mathematics on adolescents' attitude and academic performance.

Table 4.: ANOVA on the Use of Test-Taking Skills in Mathematics on Adolescents' Attitude and Academic Performance

	Sum of Squares	DF	Mean Square	F	F critical	Sig.
Between groups	27.21	2	13.61	7.10	2.79	0.000
Within groups	756.99	194	3.90			
Total	784.19	196				

F7.10= 2.79 <0.000

Results of the ANOVA and descriptive mean statistics revealed that significant relationship exist in the use of test-taking skills in Mathematics and adolescents' attitude and academic performance. Reasons being that in the ANOVA statistics, the calculated p value of 0.000 was found to be lower than the level of significant 0.05 (*Statistical benchmark*) while the calculated F ratio value of 7.10 was found to be higher than the F critical 2.79. In addition, the descriptive statistics responses on average (mean) showed that use of test-taking skills and adolescents' attitude towards mathematics test by female students was greater than their male counterparts (from a 20-item mathematics achievement test). Thus on the general note, the students test-taking skills was greater than their attitude towards learning mathematics (from a 12-item questionnaire rated on a 4-Likert). Therefore, the null hypothesis which states that there is no significant impact of use of test-taking skills on adolescents' attitude towards mathematics test is hereby rejected. Hence, the use of test-taking skills significantly impact on adolescents' attitude towards mathematics test.

Discussion of Findings

Findings from hypothesis One as evidenced from table 2, revealed a calculated F-value of 3.02 (F- critical. = 1.07) given 2 and 194 degrees of freedom at 0.05 level of significance. Hence, use of test-taking skills in mathematics significantly impacts on adolescents' level of test anxiety and academic performance.

This finding, contradicts Al-Fraidan and Al-Khalaf (2012) and Dodeen (2015) who argued that taking many tests in life does not guarantee the achievement of skills or strategies to deal with anxiety associated with testing situation in appropriate manner. This explains why Dodeen (2008) cited in Khosravani, Zanjani and Najafabadi (2017) revealed that test-taking skills is advantageous in ensuring test validity and test reliability, not in dealing with test anxiety of the tests. The finding however supports Sefcik, Bice and Prerost (2013) who opined that test-taking skills are useful in a 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. In support of this, Dodeen, Abdelfattah and Aishumrani (2014) assessed the relationship between students' test-taking skills and mathematics anxiety with a random sample of 626 (372 males and 254 females) secondary school students. The study discovered that the relationship between test-taking skills and mathematics anxiety was significant.

Findings from hypothesis two with evidence from table 3 showed a calculated F-value of 4.76 (F- critical. = 3.91) given 2 and 194 degrees of freedom at 0,05 level of significance. Therefore, use of test-taking skills in mathematics has a significant impact on adolescents' motivation and academic performance.

Contrary to this finding, Eusook and Magdalena (2006); Majzub and Kurnia (2010); Martini and Senechal (2011) reported no nexus between the use of test-taking skills and motivation towards learning mathematics. For instance, Eunsook and Magdalena (2006) explored test-preparation awareness, alongside their test-preparation skills and test-taking skills of high school students in mathematics (Algebra) test. While they observed the 156 high school students in two categories (high achievers and low achievers) in all the three domains of test-preparation awareness, the findings discovered no correlation between test-preparation awareness, test-preparation skills and test-taking skills of high school students in mathematics. This current empirical finding corroborates Majzub and Kurnia (2010) who proposed that test-taking skills in term of anxiety, motivation, learning habit, and time-conscious resulted student's high ability in test components in secondary school. Needless to say test-taking skills enhances students' dexterity in both internal and external mathematics achievements at high school level. Similarly, Martini and Senechal (2011) found that the student's comprehension, habits and expectations were related to students' skills. The study by Martini and Senechal (2011) further confirmed that students' degree of comprehension, reading habits as well as high expectations defined the unique variance in students' test-taking skills. The authors concluded that students' comprehension, habits and expectations were significantly associated with the students' skills, thus, enhancing students' performance in mathematics achievement tests.

Findings from hypothesis three as evidenced in table 4 revealed a calculated F-value of 7.10 (F--critical. = 2.79) given 2 and 194 degrees of freedom at 0.05 level of significance. Hence, the use of test-taking skills in mathematics significantly impacts on adolescents' attitude and academic performance.

This current finding is in agreement with McCarty, Tomasino, Atkinson, Aasen and Thunk (2002); Lee and Kim (2012); Son and Strasser (2012) who reported a positive and significant relationship between students' test-taking skills and attitudes towards mathematics. McCarty, Tomasino, Atkinson, Aasen and Thunk (2002) in their empirical investigation which involved conducting a 3-week training in Heart Math learning enhancement skills (i.e. which must have involved test-taking skills), revealed that students experienced significant reductions in hostility, depression and other key indicators of psychological distress after learning Heart Math tools. Lee and Kim (2012) completed a study investigating the effects of test-taking approach, attitude and children's academic outcome in mathematics at secondary school level. The result of the study revealed that test-taking approach and students' attitude directly affects the children's performance in mathematics. In fact, test-taking approach was identified as the most significant predictor related to child's outcome in mathematics. Perhaps, Son and Strasser (2012) were right to have reported a positive and significant relationship between test-taking approach and students' learning approach. It was established that students who fall into fast learner group consistently display a positive approach towards learning and test-taking when compared with slow learner group who consistently showed negative approach towards learning and test-taking. Hence, fast learner students tend to have a positive test-taking approach in mathematics achievement tests class as well as towards learning mathematics.

Conclusion

Based on the research findings, it could be concluded, that the use of test-taking skills has significant impact on students' level of test anxiety, motivation towards learning mathematics; and attitude towards mathematics test and their eventual performance in the subject. The study has proffered a number of recommendations which when implemented will help in the long run to enhance students' academic performance especially in mathematics.

Recommendations

Based on the findings and conclusion in this study, the following recommendations were proffered;

1. The Nigerian Government through Ministry of Education should also organize subject-related discovery symposiums (i.e. seminars) for teachers (i.e. mathematics teachers). Such symposiums should be tailored towards test-taking skills and techniques, it should be involved a paradigm shift from the outdated to the updated techniques of internalizing skills in mathematics achievement tests.
2. School Authorities should organize training and programmes which should be geared towards orientating their mathematics teachers on the expected skills as it will improve on students' skills in mathematics tests.
3. Parents should be committed to their responsibility in meeting their needs (irrespective of their gender, age groups or class types) so as to enhance their cooperation with teachers who are committed to the teaching of mathematics.

4. Curriculum planners especially those involved in teacher's professional development, should use the present research findings to peruse into relevant and updated test-taking skills which could impacts on students' achievement in mathematics. Such relevant and updated skills should be penned down with inks in form of teachers' guided textbook on test-taking skills.
5. Well-meaning educational researchers should replicate this research with a larger sample size of students while covering larger area of study in order to authenticate the findings obtained from this present research; they should also use more stringent research designs (i.e. experimental research designs, qualitative research designs, etc.) while sampling school teachers instead of school students.
6. Moreover, mathematics teachers are expected to display expertise by teaching student's peculiar skills (test-taking skill) that would make them flourish in mathematics thereby motivating them in learning mathematics.
7. On the part of students, every learner must be active in their own learning. It is therefore expected of students to have a positive learning habit especially towards mathematics as a subject.

Assessment Implications

The study assessment implications are that:

1. The use of test-taking skills is sine qua non to students' success in mathematics achievement test.
2. The good use of test-taking skills could improve on students' level of anxiety, attitudes and motivation towards learning mathematics, which would improve on students' performance in both internal and external mathematics examinations.

Sociological Implications

A holistic assessment of the findings and the explored literature in the study reveals that test anxiety, poor motivation and attitude to the leaning of mathematics affect students' academic performance in the subject. The study has however shown that adopting of Test-taking Strategy or imbibing of test-taking skills in learners would help to improve the learners' academic performance. This revelation is gratifying given that students' poor academic performance is an issue of great social concern as many students have had their academic career truncated by this, leading to school drop outs, also a nagging social problem. With the recommendations provided by the study duly implemented, the problem of students' poor academic performance especially in mathematics and its attendant social problems would have been addressed. Also, with this, the quality of societal manpower being turned out to drive the economy by our educational institutions would be greatly improved as mathematics is central to most career

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