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Contents

Analysis of Students' Perceived and Actual Weaknesses as Correlates of Performance in Mathemetics in Senior Secondary School Certificate Examinations in Oyo State, Nigeria

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Abstracts

The low levels of mathematical attainment of students at the secondary *school level of the educational system in the country have given patriotic Nigerians a worry. This is so because of the universally held assumption of the importance of mathematics to the growth and development of mankind. This study made use of descriptive research design. The study is restricted to ten local government areas in Ibadan land with one secondary school in each local government. The sample for this study was made up of ten senior secondary schools using simple random sampling procedure to select school in each local government area. Also, simple random sampling was used to pick one arm of Senior Secondary class three in each school, and all the students in the class selected were used for the study. Three research instruments were used with reliability coefficients of 0.72, 0.62 and 0.67 respectively. Results from the study indicated that students take mathematics in the senior school certificate examinations without a strong ability to remember, write formulae correctly and to apply the formulae correctly. They also have the wrong notion that mathematics is a difficult subject. To achieve success and enhance performance, the students must as a matter of necessity be able to cultivate mathematical skill so as to be able to better their lot. Students of mathematics who cannot perform basic mathematical operations and their characteristics will surely be unable to answer any question correctly in mathematics. Also thinking that mathematics is a difficult subject, shows how*

careless and lazy the present day students are. In conclusion, teachers of mathematics are expected to reorganize their teaching methods and personal relationship with their students to stimulate interest and love for mathematics. Better attention should be given to the teaching of English language and mathematics in schools. Teachers should also adopt the pattern of the external examinations, in setting and marking internal examinations. More emphasis on assignments, basic mathematics symbols and basic mathematical operations should be given to the students. Recommendations were made that students should be made to realize and appreciate that no school subject is more difficult or simpler than the others. Professional and highly skilled teachers should be recruited to help improve the status of mathematics in the schools.

Key words: Perceived weaknesses, correlate, actual weaknesses, senior secondary school students.

Introduction

Background to the study

The low level of mathematical attainment of students at the secondary school level of the educational system in the country is giving the patriotic Nigerians some sense of worry. This is so because of the universally held assumption of the importance of mathematics to the growth and development of mankind.

It is believed that secondary education is the base for manpower production of any country. The National Policy of Education. (FME, 2008) stated that secondary education should serve as a preparation for useful living within society and for higher education. Senior secondary education provides both vocational and academic education (Ivowi, 1987). Mathematic education is equally important for those who want to go in for higher-level education and for those who may not continue in the academic line. Mathematics education is necessary at the secondary school level so as to enable young people to prepare for the study in various disciplines in schools/

faculties of science, agriculture, social science, medicine and technology at the tertiary level of education.

The role of mathematics in the world cannot be overemphasized. It is indispensable in all facets of life. Mathematics is the hub around which all the science and environmental professions are built. It is a useful tool in the hand of engineers and technicians. The military finds it useful in their business of warfare. Housewives and marketers also use it from time to time for their daily activities; for planning and decision making. In short, every human being make use of it either consciously or unconsciously.

At the senior school certificate level, a credit pass in the subject is required for entry in to the University; polytechnics, Colleges of Education and other higher institutions of learning for courses in science, social science, agricultural, medical sciences and Technology. Mathematics is one of the major subjects that is preventing most of Nigeria secondary school graduates from gaining and reading science and allied courses in the higher institution. This is because some schools have scored below 5% in mathematics in senior secondary school examination results. Also every phase of economics planning demands not only capital but skilled manpower which can only be drawn from a reservoir of educated population. This cannot easily be received with poor performance of students in an important subject like Mathematics.

Base on the foregoing, Mathematics is very important science subject that is very necessary for the management of natural science resources, provision of good health facilities, adequate food supply and favourable living environment. For effective application of natural science, an understanding of Mathematical concepts and phenomenon is very essential. The importance of Mathematics and its relevance to other discipline and even life had made the subject to be one of the sciences without which all other areas of life and technology would become paralyzed. One should therefore expect that the teaching and learning of Mathematics will attract the interest of every student, community and the government.

Johnes (1990) opined that the need for ones' education should stand as an instrument to solve whatever problems that may be

troubling one. It is on this statement that the researcher is interested in finding out the weaknesses which is actually affecting students' performance in Mathematics. that is, the militating factors that are preventing them from passing it creditably. A lot of factors have been held responsible for the observed low performances of students in mathematics. Some of these include sex, teachers, school environment, family size and environment, relationship between teacher and students, available teaching aids and instructional materials (Iroegbu 1992).

There is a general erroneous belief that mathematics is difficult, thus many students do not take mathematics at the senior secondary school level so serious. This believes could be one of the major factors for students' under achievement in mathematics because there is no way one can perform brilliantly in a subject for which one has no interest. The poor performance in Mathematics is obvious when cognizance is taken of students' enrolment and performance in the Senior School Certificate Examination (Table1) between 2000 and 2009.

Table1: Statistical Data on Entries and Performance of Candidates in Wasce/Ssce Mathematics May/June 2001-2009

YEAR	NO OF CANDIDATES	A1-C6		P7 & P8		F9	
	ENROL FOR MATHS	No of Credit	%	No of Pass	%	No of failure	%
2001	1023102	373955	36.40	334270	32.70	314240	30.70
2002	908235	309409	34.10	308369	33.90	308369	34.00
2003	1024451	377312	36.80	359630	35.10	3579630	23.70
2004	1019524	346410	34.00	287184	28.20	351512	34.50
2005	730379	282394	38.20	192064	26.30	255939	35.00
2006	1149277	472674	41.10	357325	31.10	286826	25.00
2007	1249028	584024	46.80	333844	27.30	302774	24.20
2008	1268213	726398	57.40	302266	23.80	218618	17.20
2009	1348528	633808	47.00	345223	25.60	315556	23.40

Source: WAEC, Research Section, Lagos. (Nigeria Statistics of Entries and Result)

A lot of energy has been spent on research work though conferences, workshop and seminars to find solutions to students' poor performance in mathematics in particular. Ivowi, Okebukola, Owodotun and Akpan (1992) listed five weaknesses that are responsible for students poor performance in Mathematics as: dearth of mathematics teachers' difficulty in understanding mathematics, inadequate learning facilities, poor laboratory facilities, lack of encouragement from home, and student's poor study habit. Some students' perceive Mathematics as a very difficult subject among others so they have phobia for it and jettison the principle of having a thorough knowledge of the subject for a better future

Some of the teachers assigned to teach Mathematics in many schools are not adequately qualified to teach it (Soyemi 2006). The way these kinds of teachers handle the subject make the students perceive it as being difficult. Some of them even teach mathematics as if it is history with little or no practical work in the classroom. This make the subject to look like abstract and meaningless to students and this method of teaching bring no development in the life of both the students and the community at large.

In any instructional engagement, there is a need to generate, arouse, and maintain learners' interest. One way of doing this is to use instructional aids. It is, however disheartening to note that some teachers do not make use of teaching aids while teaching. Whereas Kolawole (2000) contends that the use of instructional material can make learning become more concrete, real and permanent.

Inconsistent government policies and political instability also contribute greatly to educational problem of a country. Instability in government which directly calls for constant change of minister and commissioners for education, thereby affecting educational system and endangers academic performance of students. Strike action embarked upon by teachers whenever they experience cold-shoulder treatment from the government also affect academic programme. When an academic programme is thrown into disarray, there is likelihood of academic improprieties on the part of the students.

A lot of weaknesses have been responsible for the observed poor performance of students in mathematics. Therefore, the present study takes a look at the some of the weaknesses like inability to remember and write formulae correctly, wrong application of formulae, poor diagram and construction, misuse and miss-interpretation of mathematics symbols, miss read and interpretation of questions, poor study habit and inability to master basic mathematical operations well.

Statement of the problem

Researchers on mathematics had observed over the years the low level of performance and high rate of enrolment in the mathematics subject across schools and states. Fehintola (2009) is of the opinion that high rate of poor performance in mathematics calls for concerns as learners tend to question the rationale behind taking to the study of mathematics as they progress in the school system. The researcher believe that the problem could be hinged on the influence of variables such as inability to remember and write formulae correctly, wrong application of formulae, poor diagram and construction, misuse and miss-interpretation of mathematics symbols, misread and interpretation of questions, poor study habit and inability to master basic arithmetic operations. The study, therefore seeks to examine the extent to which variables such as inability to remember and write formulae correctly, wrong application of formulae, poor diagram and construction, misuse and miss-interpretation of mathematics symbols, misread and interpretation of questions, poor study habit and inability to master basic arithmetic operations affect the learners' performance in mathematics.

Research Questions

Based on the stated problems, the study seeks to provide answer to the following questions.

RQ1. What are the students' weaknesses which affect their performances in mathematics?

RQ2. Is there any significant difference in the responses of teachers and students on weaknesses which affect their performances in mathematics?

Significance of the study

To succeed in today's environment, students need a clear understanding of subjects like mathematics and English language. There is a prevailing need to enhance their level of understanding of mathematics among students. This research therefore, would help in investigating the factors that militating against good performance in mathematics as it affects the career and educational aspiration of students and apply psychological principles and methods that will help enhance the development of appropriate skills that would enable students understand mathematics.

The expected findings of the study should equally bring to the attention of the government agencies the necessity for establishing counselling services in schools as a means of giving students support on their difficult subjects.

Also, the findings generated from the study will hopefully be useful to researchers, counselling and educational psychologists, school administrators and significant others in various fields who are bothered about the inability of in-school adolescents to perform well in Senior Secondary School mathematics and needed measures to remediate this development.

Methodology

Research Design

This study made use of descriptive research design which does not involve direct control of any variable or any experimental manipulation.

Population

The target population for this study consists of all mathematics teachers and SSS3 students in all the public secondary schools in Oyo state.

Sample and Sampling technique

The study is restricted to ten local government areas in Ibadan land with one secondary school in each local government. The sample for this study was made up of ten senior secondary schools (SSS) using simple random sampling procedure to select school in each local government area. Also simple random sampling was used to pick one arm of SS3 in each school and all the students in the class selected were used for the study.

All the mathematics teachers in the participating schools are qualified to participate in the study. In all, the sample comprises of forty (40) teachers and nine hundred and eighty seven (987) students. SS3 students were used for the study since they are the final year students and will soon sit for the SSCE. Having spent two years already in the senior secondary school and they were in first term SS3 when the data were collected.

Instrumentation

Three instruments were used in carrying out this study as shown below:

Questionnaire on Students' perceived Weaknesses in Ordinary Level Mathematics

The students' perceived weaknesses Questionnaire in Ordinary level mathematics was developed by the researcher. It was designed through a review of the senior school certificate Mathematics Chief examiners' (WASSCE) reports on students' performance in mathematics. The instrument was validated by three mathematics educators and Chief examiner for mathematics (WAEC). This questionnaire solicited information about the weakness areas of students in mathematics. Respondents to this instrument are students that are in SS3 and all mathematics teachers. Section A is the Bio data of the respondents while the section B is 30 items on the subject matter. The structuring of the instrument is based on a four point summated ratings scale of Strongly Agree=4, Agree=3, Disagree=2 and Strongly Disagree=1. This instrument was trial tested on 50 SS3 students. The pre-test showed no ambiguities in the instrument. Cronbach alpha (an estimate

of content validity and internal consistency reliability of the items) was computed and it yields a reliability estimate of 0.72 and 0.69 respectively.

Weaknesses in Mathematics Detecting Rating Scale (WEMADERAS)

WEMADERAS was developed by the researcher. It was designed to be used in observing the weaknesses that are militating against good performance in mathematics at senior secondary school level. The scale is 20 items in the area of the weaknesses of students in mathematics. The observer/ rater has to rate the weaknesses observed while marking the essay mathematics achievement test on a four point summated ratings scale of never=1, usually=2, always= 3 and N/O = 4 (No opportunity to observe). The scale has been trial tested and found to be reliable with reliability coefficient of Cronbach Alpha of 0.64.

Essay in Mathematics Achievement Test (EMAT)

EMAT consists of 10 essay questions based on topics which are expected to be taught in Senior Secondary class one to Senior Secondary class three. This test was designed to give more information on students' actual weaknesses as this will be compared with the perceived weaknesses earlier cited in the literature. These weaknesses will be assessed while marking the solutions to the essay questions. This instrument was found to reliable with reliability coefficient of 0.75.

Data Collection Procedure

The principal of the chosen schools were briefed about the purpose of the study for permission so as to allow the researcher to make use of their pupils for the study. The pupils were informed as well. One arm of the total SS3 students in each school were taken at random to participate in the study. In a situation where a chosen school has more than one arm, an arm was taken at random and in situation where there was an arm in the school the whole SS3 students in such school were used. The observations of expert of Mathematics teachers of the chosen schools were done for four weeks in 10 different schools. The

selected class of each chosen school was observed for at least four lesson periods. The observation was meant to detect whether the weaknesses will manifest from the way the students are being taught on the part of the teachers. The questionnaire on perceived students' weaknesses was administered to both the students and the mathematics teachers.

Data Analysis

RQ1. What are the students' weaknesses which affect their performances in mathematics?

This research question was answered using frequency counts with the aid of the Weaknesses in Mathematics Detecting Rating Scale (WEMADERAS) on the errors committed in course of solving Essay Mathematics Achievement Test (EMAT) discovered during the marking exercise.

Table 1: Analysis of Students Weaknesses as detected in course of marking the Essay Mathematics Achievement Test

Item	observed	Not observed
Inability to remember and write formulae correctly.	499(50.6%)	488(49.4%)
Inability to apply the formula correctly.	532(53.9%)	455(46.1%)
Poor construction ability.	498(50.5%)	489(49.5%)
Poor drawing and wrong labeling of diagrams.	527(53.4%)	460(46.6%)
Failure to interpret problems involving wording.	609(61.7%)	378(38.3%)
Students poor study habit.	530(53.7%)	457(46.3%)
Inability to identify and interpret mathematical symbols correctly.	961(97.4%)	26(2.6%)
Student's anxiety/phobia on mathematics as a subject.	927(93.9%)	60(6.1%)

Inability to read and understand WASSCE/NECO. instructions and questions	916(92.8%)	71(7.2%)
Poor understanding of basic mathematical operations.	539(54.6%)	448(45.4%)
Teachers not following WAEC/NECO pattern in setting and marking internal exams.	588(59.6%)	399(40.4%)
Poor use of English language.	888(90%)	99(10%)
Poor mathematical ability.	878(89%)	109(11%)
Poor understanding of topics on geometry, construction and graphing.	574(58.2%)	413(41.8%)
Wrong assumption that mathematics is a difficult subject.	599(60.7%)	388(39.3%)
Poor writing due to examination condition	565(57.1%)	422(42.8%)
Attitude of examination supervisors and invigilators	514(52.1%)	473(47.9%)

The results in table 1 show that these weaknesses were clearly shown in the Essay Mathematics Achievement Test. Therefore all these weaknesses are responsible for the failure of senior secondary school students in Mathematics External Examinations.

RQ2. Is there any significant difference in the responses of teachers and students on weaknesses which affect their performances in mathematics?

Data were analyzed using simple t-test statistics for mean differences in the opinion of students and their teachers as regard the perceived students' weaknesses.

Table 2: Analysis of Students Weaknesses which affect their Performances in Mathematics

Item	Variables	N	Mean	S. D	T	P
Inability to remember and write formulae correctly.	Teachers	40	1.6000	.49614	1.296	.195
	Students	987	1.4954	.50023		
Inability to apply the formula correctly.	Teachers	40	1.6250	.49029	1.269	.205
	Students	987	1.5228	.49973		
Poor construction ability.	Teachers	40	1.6750	.47434	1.842	.066
	Students	987	1.5268	.49953		
Poor drawing and wrong labeling of diagrams.	Teachers	40	3.6000	.49614	1.549	.122
	Students	987	3.4752	.49964		
Failure to interpret problems involving wording.	Teachers	40	3.1500	.97534	1.481	.139
	Students	987	3.3273	.73129		
Students poor study habit.	Teachers	40	4.0750	1.07148	.937	.349
	Students	987	4.2158	.92576		
Inability to identify and interpret mathematical symbols correctly.	Teachers	40	4.4250	.63599	.094	.925
	Students	987	4.4174	.49338		
Student's anxiety/phobia on mathematics as a subject.	Teachers	40	4.6500	.48305	1.642	.101
	Students	987	4.5177	.49994		
Inability to read and understand WASSCE/NECO. instructions and questions	Teachers	40	2.9500	.98580	1.646	.100
	Students	987	2.6626	1.08589		
Poor understanding of basic mathematical operations.	Teachers	40	8.5750	1.44803	.421	.674
	Students	987	8.6960	1.79328		

Teachers not following WAEC/NECO pattern in setting and marking internal exams.	Teachers Students	40 987	2.2750 2.2449	1.17124 1.27313	1.471	.142
Poor use of English language.	Teachers Students	40 987	6.2425 6.1370	5.45794 4.88800	1.332	.183
Poor mathematical ability.	Teachers Students	40 987	1.0105 0.9974	6.44483 5.96197	1.362	.174
Poor understanding of topics on geometry, construction and graphing.	Teachers Students	40 987	2.3500 2.2644	.57957 .53667	.985	.325
Wrong assumption that mathematics is a difficult subject.	Teachers Students	40 987	4.0275 4.0754	4.95098 4.03297	.729	.466
Poor writing due to examination condition	Teachers Students	40 987	6.3950 6.2849	5.56523 5.07535	1.340	.181
Attitude of examination supervisors and invigilators	Teachers Students	40 987	6.3700 6.2739	5.88871 4.91206	1.204	.229

Findings

It was discovered that the following among others were the students weaknesses which affect their performances in mathematics:

1a) Inability to remember and write formulae correctly.
b) Inability to apply the formula correctly.
c) Poor construction ability.
d) Poor drawing and wrong labeling of diagrams.
e) Inability to interpret problems involving words
f) Students poor study habit.
g) Inability to identify and interpret mathematical symbols correctly.
h) Students anxiety/phobia for mathematics as a subject.

i) Inability to read and understand WAEC/SSCE. instructions and questions
j) Poor understanding of basic mathematics operations.
k) Teachers not following WAEC/NECO patterns in setting and marking internal examinations.
l) Poor mathematical ability.
m) Poor use of English language.
n) Poor mathematical ability.
o) Poor use of English language.
p) Poor understanding of topics on geometry, construction and graphing.
q) Wrong assumption that mathematics is a difficult subject.
r) Poor writing due to examination condition.
s) Attitude of examination supervisors and invigilators

2. There was no significant difference in the responses of teachers of mathematics and their students on the students' weaknesses that affect their performances in mathematics.

Discussions

Secondary schools students in Nigeria battle enthusiastically to take examinations without probably considering their weaknesses which undermine their performances in such examinations.

Results from the study indicated that students take mathematics in the senior school certificate examinations without a strong ability to remember, write formulae correctly and to apply the formulae correctly. They also have the wrong notion that mathematics is a difficult subject. These students' weaknesses are surprising when one considers the fact that mathematical ability is a serious problem to successful mathematical performance. To achieve success and enhance performance, students must as a matter of necessity be able to cultivate mathematical skill so as to be able to better their lot. Students of mathematics who cannot identify basic mathematics operations and their characteristics will surely be unable to answer any questions correctly on mathematics. Also thinking that mathematics is a difficult subject, shows how unserious the present day students are. As a backbone to other science subjects, mathematics is made up of

knowledge from such areas as physics, chemistry, statistics, economics and even accounts. All these subject areas need sound reading and assimilation of facts before good leaning can take place. Feeling that mathematics is not easy means that students are not taking cognizance of the effect, these basic sciences will have on their performances in their examinations.

Students poor study habit (their inability to know that we do not read mathematics like other subjects) is a major problem in understanding mathematics. Some students read mathematics instead of working or solving mathematics problems. Some students do not know the correct usage of equality sign due to lack of practice. Inability to read and understand WAEC/SSCE instructions in the external examinations as well as poor mathematical ability can be seen as basic neglect of the fundamental fabric of a practical oriented subject like this. Therefore anyone interested in studying mathematics must try to solve problems on mathematics on daily basis, it should be every day affairs, and student should not procrastinate in solving mathematics problems. Observed poor mathematical computational ability by secondary school students has been attributed (Swetz et al 1983 and Alken, 1976) to students' poor attitude or dislike for mathematics.

Inability to remember formulae for solving mathematics problems correctly as well as poor use of English language are embarrassing weaknesses of students observed from the study. Mathematics is full of formulae and other symbols which are both local and foreign. The internalization of these symbols by students is very paramount. Therefore answers not properly written in good English, even if they are the best, surely deprive the students some pertinent scores essential for their success. This confirm observation and the views expressed by Azikiwe (1991) and Eyibe (1992) that when a well educated teacher corrects the answer scripts of a student in any discipline, he is not only paying attention to the points the student is making but also the level of English he uses in his writing. The study also revealed that students do not allocate sufficient time to the solving of mathematical problems. This is not surprising since the students are

of the impression that mathematics is not an easy subject. There is a need for a change of attitude by the students.

Finally, there was no significant difference in the responses of teacher of mathematics and their students on the students weaknesses which affect their performances in mathematics. A second look at the data in table 1 shows that the students' weaknesses are very glaring and fully recognized by both teachers and students. Attention should be focused on how to ameliorate or correct these weaknesses.

Conclusion

The results from the study have simply highlighted that Mathematics occupies a prominent position in the technological development of nations worldwide. With the above results from the study, one can see that the future development of mathematics is bleak unless something is done urgently. The consequence of this is lack of technological development and lack of personnel in the areas of engineering, agriculture, medicine, chemistry, physics etc. The school system and the education stake holders are therefore expected to do much to reverse the situation.

Teachers of mathematics are expected to reorganize their teaching methods and personal relationship with the students to stimulate interest and love for mathematics in them. Better attention should be given to the teaching of English language and mathematics in schools. Teachers should also adopt the pattern of the external examinations, in setting and marking internal examinations. More emphasis and assignment should be given to the students on basic mathematics symbols. Students should be made to realize and appreciate that no school subject is more difficult or simpler than the others. Professionally and highly skilled teachers should be recruited to help improve the status of mathematics in the schools.

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