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Effectiveness of Guided Multiple Choice Objective Questions Test on Students' Academic Achievement in Senior School Mathematics by School Location

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Abstract
This study investigated, using pretest-posttest quasi-experimental research design, the effectiveness of guided multiple choice objective questions test on students' academic achievement in Senior School Mathematics, by school location, in Delta State Capital Territory, Nigeria. The sample comprised 640 Students from four co-education secondary schools, randomly assigned to control and experimental groups. Four research questions and four null hypotheses guided this study. Three instruments, Mathematics Assessment Test (MAT) 1, 2 and 3 were used to collect data. Difference in Mean Academic Achievement was subjected to z-test statistic and was significant in favor of the experimental group. Implications and recommendations of the study were advanced.
Keywords: Guided and Unguided Multiple Choice Objective Questions Test; Academic Achievement of Students; School Locations.

Introduction

It is a common knowledge that teachers are the implementers of the curriculum. It is through teaching of various subjects, by the teachers, that the task of curriculum implementation is done. This actually occurs during teaching - learning process. The teacher actually has a set of behavioral objectives which the students have to attain by the end of the lesson. So, by the end of the lesson, the teacher evaluates the students through some questions or tests to know the extent of attainment of the behavioral objectives.

One of the tests use by the teachers to evaluate the level of attainment of the behavioral objectives by the students is the Objective Questions Test. According to Egbule (2002), objectives test is a well structured test item in which the testee or student is required to identify or select the correct option from a given set of alternatives. He added that there are several types of objective which include: (i) multiple choice, (ii) true or false / yes or no, (iii) matching items and (iv) fill in the blank space. This paper delimits itself to the multiple choice objective questions test. According to Jonah-Eteli (1999), Multiple Choice Objective Test is a question with three or more alternatives out of which one is correct; the more the alternatives the more reliable to a point. He emphasized that the choice of the number of alternatives depends on the age and ability level of the examinees. They could be designed to assess objectives at any level of the domain.

In some subjects, the objective test is guided, while in other subjects, it is unguided. An example of the subject where there is guided objective question is English Language. In this case, an example is given to the students to guide them answer a set of objective tests. In a subject like Mathematics, most questions are presented to the students without guided examples. The objective questions test that is guided with example is called guided objective questions test, while the one without guided example is called unguided objective questions test.

According to lgbojinwaekwu (2012), the guided objective questions test directs the examinees to the correct option easily, than the unguided objective questions test. He stated that guided objective questions test gives the students an advantage to recall easily than the unguided questions. Also, the difficulty experienced by students to memorize facts is removed by the guided multiple choice objective questions test, while the unguided multiple choice objective questions test encourages memorization of facts. The guided multiple choice objective questions test encourages application of knowledge rather than memorization.

Guided multiple choice objective questions test emanated from guided discovery method of teaching in which the learner is presented with problems and at the same time given a number of cues, hints and instructions that could guide him/her solve the problems (Oghenevwede, 2012). In other words, this method is student or learner centered and, so, gives him/her the independence of using the cues, hints and instructions to arrive at the needed answers to the problems presented to him/her. This agrees with FRN (2013) which de-emphasized memorization and regurgitation of facts which are common in schools, today, but emphasized practical exploratory and experimental methods of teaching, which should be accompanied with guided method of assessment and which can lead to a sustainable high academic achievement of students and development of the nation, at large.

Academic achievement is the score or grade a student obtains after sitting for an examination or a test.

It could be an internal or external examination.

In DSCT, Secondary Schools are either established in the rural and urban areas. The rural and urban areas where Schools are established are called the School Locations.

In this era of loaded curricula and the discouraged results in Mathematics, year after year, in SSCE, concerned mathematics teachers and other stakeholders in education are looking for a strategy to make students perform better. Akpan (1987) has recommended in one of his researches that teachers should find ways to encourage both boys and girls to study and pass mathematics with ease at all levels. This appeal, also, gave birth to this study.

Mathematics is the science of structure, order, numbers, space and quantity; it is a relationship which revolves around the elementary practice of counting, measuring and describing of shapes and objects (Soyemi, 2002). Maduabum and Odili (2006) described Mathematics as the science of quantity and space which occupies a key position in the Nigerian Educational System. Graham (1975) in Igbojinwaekwu (2004) posited that mathematics is a general science in which arithmetic, geometry, algebra, trigonometry, etc are branches. Sowunmi (1986) in Igbojinwaekwu (2004) asserted that mathematics is the symbolic logic of possible relations and concerned with hypothetical truth. According to Igbojinwaekwu (2009), mathematics is a truthful way of finding solutions to problems; these problems abound in our everyday life activities.

the Nigerian Educational System because of the vital role it plays in the advancement of science and technology in In Nigeria, one of the ways through which any school, be it at the primary or secondary or tertiary level is assessed, is on how serious mathematics education is handled (Igbojinwaekwu, 2013). This is because of the key position mathematics occupies in the Nigerian Educational System and its application in developmental processes of any nation. In this vein, Akuezuilo and Chinwoeke (2009) stated that mathematics is the bedrock of all science subjects and is, therefore, needed for scientific and technological advancement of any nation. Maduabum and Odili (2006) posited that mathematics occupies a key position in contemporary society. According to Osafehinti (1990) and Aminu (1995), any society which aspires to be scientifically and technologically developed must be ready to take mathematics education very serious, since mathematics has ingredients for the effective articulation of the abstract elements of science that gives impetus to the development of technologies. Supporting Osafehinti (1990) and Aminu (1995), Ukeje (1997) stated that without mathematics, there is no science, without science, there is no modern technology and without modern technology, there is no society. Ukeje (1997) , therefore, concluded that mathematics is the precursor and the queen of science and technology and the indispensable single element in modern societal development. Also, supporting Osafehinti (1990) and Aminu (1995) assertions, Abiodun (1997) in Chinweoke (2008) observed that while science is the bedrock that provides spring board for technology, mathematics is the gate and key to science; he concluded that any nation seeking scientific and technological development, must also address the issue of mathematics. Rogers (1986), explained that Mathematics has become the central intellectual discipline of the technological society and that as the society develops so will its quantitative aspects assume greater influence and dominance over its qualitative features. Eguavon (2002), described mathematics as the pivot of all civilization and technological development. Supporting Eguavon (2002), Imoko and Agwagah (2006), opined that mathematics is a key factor in the development of any nation.

Mathematical concepts and symbols are used in expressing the physical laws of nature (Tsue and Anyor, 2006). Therefore, mathematical concepts and methods provide scientists with insight, into and about natural phenomenon. Ikeobi (1994) and Njoku (1997) opined that chemical kinetics, chemical equilibrium, stiochemistry, mole concept, solubility, electrolysis, redox reactions and ionic equations are areas in chemistry that require a good knowledge of mathematical concepts. Jegede (1979), identified ratio, charts, proportions, measurement and statistics as the mathematical concepts needed in biology. Egbugara (1980) indicated that algebra, trigonometry, graphs, calculus and differential equations are the mathematical concepts required in physics and engineering science. Realizing the views of the aforementioned researchers on the importance of mathematics in national development and its position in the school system, the Federal Republic of Nigeria (FRN) (2013) is continuously emphasizing the importance of mathematics in national development by making the subject compulsory for both pupils and students in Primary and Secondary Schools. Supporting FGN, Maduabum and Odili (2006), asserted that for a nation such as ours, aspiring for scientific and technological take-off, the need to pay due attention to our students academic performance in mathematics cannot be over emphasized. Regrettably**,** despite the importance of mathematics as a key subject in realizing any nations scientific and technological aspirations, there is ample evidence of continued low interest in the subject by Nigerian students (Odili. 1992). Also, reporting to the National Council on Education (NCE) on students' performance in the May/June SSCE, the West African Examinations Council (WAEC, 2012, 2013 and 2014) lamented the low achievement and interest in mathematics by Nigerian candidates.

Many reasons have been advanced for the continuous dismal state of mathematics in Nigeria, at all levels of education. While some researchers (Ali, 1989; Harbor-Peters, 1992) viewed teachers' incompetence as a contributing factor, other findings (Adeniyi. 1988; Alio and Harbor–Peters, 1997) attributed the low interest in

mathematics to teachers' non utilization of appropriate teaching techniques. Many teachers in schools use only techniques they know, even if such techniques are not relevant to the concept under discussion (Akinsola and Popoola, 2004). Opara (2004) advised that teachers should evolve strategies that involve learners active participation. Such strategies will generate interest in the students. Igbojinwaekwu and Nneji (2012) attributed the high failure rate of students in Senior School Certificate Examination due to the structure of questions in the examination. No study, to the best of the knowledge of the researcher, has reported on the effect of guided multiple choice objective questions on academic achievement of students in DSCT, Nigeria. This was what aroused the researcher's interest.

Examination/test is one of the important ways of evaluating the curriculum in place/use. Also, the type of examination/test that is given to students in course of teaching-learning process, is equally important, because apart from assessing whether the behavioral objectives of the topic are attained, it is used to find out if the teacher has to change his teaching method or not. Igbojinwaekwu (2012) affirmed that in Senior School Certificate Examination (SSCE) Oral English, guided objective questions are used to test the performance of Senior School Students and that students' performance are found to be better than those tested with unguided objective tests. The researcher, therefore, wanted to know if the same situation could be applicable to mathematics students at the senior school level. The statement of the problem is, therefore, stated thus: what effect will guided objective questions have on academic achievement of students in mathematics at senior school level with regard to school location?

Research Questions

The following eight research questions guided this study.

1. To what extent has guided multiple choice objective questions test enhanced the academic achievement of Senior School 2 (SS2) students in Senior School Mathematics?
2. To what extent has guided multiple choice objective questions test enhanced the academic achievement of SS2 students in Senior School Mathematics in rural area?
3. To what extent has guided multiple choice objective questions test enhanced the academic achievement of SS2 students in Senior School Mathematics in urban area?
4. How has guided multiple choice objective questions test enhanced the academic achievement of SS2 female students in Senior School Mathematics in schools in rural area?
5. How has guided multiple choice objective questions test enhanced the academic achievement of SS2 male students in Senior School Mathematics in schools in rural area?
6. How has guided multiple choice objective questions test enhanced the academic achievement of SS2 female students in Senior School Mathematics in schools in urban area?
7. How has guided multiple choice objective questions test enhanced the academic achievement of SS2 male students in Senior School Mathematics in schools in urban area?
8. How has guided multiple choice objective questions test enhanced the academic achievement of SS2 students in rural school vis-a-vis SS2 students in urban school?

Null Hypotheses

The following eight null hypotheses where tested at P<O.O5 level of significance on a 2- tailed test.

HO_1: There is no significant difference between the academic achievement of SS2 students exposed to guided and unguided multiple choice objective questions test in Senior School Mathematics.

HO_2: There is no significant difference between the academic achievement of SS2 students exposed to guided and unguided multiple choice objective questions tests in Senior School Mathematics in schools in rural area.

HO_3: There is no significant difference between the academic achievement of SS2 students exposed to guided and unguided multiple choice objective questions tests in Senior School Mathematics in schools in urban area.

HO_4: There is no significant difference between the academic achievement of SS2 female students exposed to guided and unguided multiple choice objective questions tests in Senior School Mathematics in schools in rural area.

HO_5: There is no significant difference in academic achievement of SS2 male students exposed to guided and unguided multiple choice objective questions tests in Senior School Mathematics in schools in rural area.

HO_6: There is no significant difference in academic achievement between SS2 female students exposed to guided and unguided multiple choice objective questions tests in Senior School Mathematics in schools in urban area.

HO_7: There is no significant difference in academic achievement between SS2 male students exposed to guided and unguided multiple choice objective questions tests in Senior School Mathematics in schools in urban area.

HO_8: There is no significant difference in academic achievement between SS 2 students in rural and urban schools exposed to guided multiple choice objective questions tests in Senior School Mathematics.

Methodology

The pretest-posttest quasi- experimental research design was adopted in this study. This was because intact classes were used and complete randomization was not possible, due to the rigid administrative setup of the schools used in this study.

The population of the study was 2,240 (1,229 boys and 1,011 girls) Senior School Two (SS2) students from twelve Public Secondary Schools in Delta State Capital Territory, Nigeria. These schools have been presenting students for Senior School Certificate Examination (SSCE) for the past five years and beyond. All the twelve secondary schools were co-educational. Six of the schools were in urban area, while the other six schools were in rural area.

Through a proportionate random sampling technique, four schools (two urban and two rural) were selected on paper, for this study. These four schools had 640 students (351 boys and 289 girls) in SS2. Out of the 351 boys, 175 were in urban schools, while 176 were in rural schools. Similarly, out of 289 girls, 145 were in urban schools, while 144 were in rural schools. SS2 students from two schools (one urban and one rural) formed the control group, while SS2 from another two schools (one urban and one rural) formed the experimental group. The control group comprised 340 (227 boys, 113 in urban and 114 in rural and 113 girls, 57 in urban and 56 in rural) SS2 students. The experimental group consisted of 300 (124 boys, 62 in urban and 62 in rural and 176 girls, 88 in urban and another 88 in rural) SS2 students. The students were randomly assigned to their groups on paper.

Three instruments, Mathematics Achievement Test (MAT) 1, 2 and 3 were used to collect data. The three instruments were researcher made. Each of these instruments consisted of two parts, A and B. Part A demanded for the personal data of each student, while B comprised 20 multiple choice objective questions on concept of polygon. MAT 1, 2 and 3 were similar except that the serial numbers of the questions were not the same and that all the multiple choice objective questions in MAT 3 were guided. Two experts, in mathematics education and another two experts, in test construction, validated the instruments, MAT 1, MAT 2 and MAT 3 on the bases of coverage of unit of work, relevance in collection of needed data and stated behavioral objectives. Kunder-Richardson 21 (K-R 21) statistic was used to determine the reliability indices of MAT 1, MAT 2 and MAT 3, which were 0.94, 0.94 and 0.91, respectively. K-R 21 statistic was used because MAT 1, MAT 2 and MAT 3 were dichotomous in nature. That is, the instruments required right or wrong answers from the students. These reliability indices were judged to be good enough to collect data for this study, following Maduabum (2004) and Egbule and Okobiah (2006) assertions that instrument made to collect data for academic achievement should have a reliability index of not less than 0.50.

Four teachers, each from the four selected secondary schools in this study, taught the students. This was to avoid Hawthorns effect. The teachers underwent training programme for two weeks, before they were certified, good enough, to teach the students. This was done, in order, to remove any inequality among the teachers. Uniform lesson notes, on the concept of polygon, were prepared for the teachers by the researcher. This was to ensure that the four teachers teach exactly the same thing, using the same steps, method, behavioral objectives and study questions or evaluative questions. The four teachers used in this study had the same years of experience in terms of service years, West African Examinations Council (WAEC) Examiners in SSCE and were all degree (B.Sc.Ed) holders in Mathematics. This was to avoid the effects of extraneous variables like year of teaching experience, external examiners experience and differences in degree from the participating teachers. In addition, the same text book was used by the teachers during teaching-learning process. This was to avoid the effect of differences in text book on the validity of the results in this study.

The students from the two groups, control and experimental, were subjected to pretest, using MAT 1 as a test instrument for 30 minutes, before the commencement of teaching-learning process. Thereafter, the students in both control and experimental groups were taught for three weeks, after which students in the control group were post-tested using MAT 2 and the students in experimental group were post-tested using MAT 3 as test instruments, for 30 minutes, respectively. Data collected from MAT 1, MAT2 and MAT 3 were subjected to analyses using percentages and Z-test statistics.

Data Analysis and Results

Research Question 1

To what extent has guided multiple choice objective questions test enhanced the academic achievement of SS2 students in Senior School Mathematics?

Answer to Research Question 1

The extent to which guided multiple choice objective questions test enhanced academic achievement of SS2 Students in Senior School Mathematics is shown in table 1.

Table 1: Pretest-Posttest Mean Academic Achievement (MAA) of SS2 Students in Senior School Mathematics

Group of Students	N	Posttested MAA	Pretested MAA	MAA Gain
Control	340	68	49	19
Experimental	300	89	47	42

Table1. Shows that students in control group have pretest MAA = 49 and posttest MAA = 68 with MAA gain = 19; students in experimental group have pretest MAA =47 and posttest MAA = 89 with MAA gain = 42. The MAA gain of 19 obtained by students in control group tested with MAT 2, unguided multiple choice objective questions, is less than the MAA gain of 42 obtained by students in experimental group tested with MAT 3, guided multiple choice objective questions, by 23. The implication is that the guided multiple choice objective questions test enhanced the academic achievement of the students, to a very great extent, more than the unguided multiple choice objective questions test.

Research Question 2.
To what extent has guided multiple choice objective questions test enhanced academic achievement of students in Senior School Mathematics in rural area?

Answer to research Question 2
The answer to research question 2 is as shown in table 2

Table 2: Pretest–Posttest Mean Academic Achievement (MAA) of SS2 Students in Rural Area

GROUP OF STUDENTS IN RURAL AREA.	N	POSTTESTED MAA	PRETESTED MAA	MAA GAIN
Control	170	51	23	28
Experimental	150	86	27	59

Table 2 indicates that students in control group who were in schools located in rural area after being exposed to MAT 2, unguided multiple choice objective questions test, obtained MAA = 51 in the posttest and MAA = 23 in the pretest prior to exposure to MAT2, with MAA gain of 28; students in the experimental group whose schools were located in rural area after being exposed to MAT3, guided multiple choice objective questions test, had MAA = 86 in posttest and prior to being exposed to MAT 3, had MAA =27, with a MAA gain = 59. The MAA gain of 59 for students in the experimental group shows that the effect of guided multiple choice objective questions test on higher academic achievement was tremendous. Besides, the difference in MAA gain between the students in the control and experimental group is 31 in favor of students in the experimental group.

Research Question 3.
To what extent has guided multiple choice objective questions test enhanced academic achievement of students in Senior School Mathematics in urban area?

Answer to Research Question 3.
The answer to research question 3 is as contained in table 3.

Table 3: Pretest-Posttest Mean Achievement (MAA) of SS2 students in Urban Area

GROUP OF STUDENTS IN URBAN AREA	N	POSTTESTED MAA	PRETESTED MAA	MAA GAIN
Control	170	55	32	23
Experimental	150	91	36	55

In table 3, students in control group exposed to unguided multiple choice objective questions test have MAA= 55 in a posttest and MAA = 32 in a Pretest, after and before the commencement of teaching - learning process, respectively, with a MAA gain of 23; their counterparts in the experimental group that were exposed to guided multiple choice objective questions test have MAA = 91 in a posttest and MAA= 36 in a pretest after and before the commencement of teaching - learning process, respectively, with a MAA gain = 55. Comparing the MAA gains of students in urban area in control and experimental groups, it is clear that students in the experimental group have higher MAA gain than those in the control group. The difference in MAA gain is 32 in favor of the students in the experimental group. This shows that the guided multiple choice objective questions test has impacted positively on the academic achievement of students in secondary schools located in urban area.

Research Question 4.
How has guided multiple choice objective questions test enhanced academic achievement of female students in

Senior School Mathematics in schools in rural area?

Answer to Research Question 4.
The answer to research question 4 is as shown in table 4.
Table 4: A Comparative Pretest – Posttest Mean Academic Achievement Analysis of SS2 Female Students in Schools in Rural Area

SS2 FEMALE STUDENTS IN RURAL AREA	N	POSTTESTED MAA	PRETESTED MAA	MAA GAIN
Control	56	58	43	15
Experimental	88	80	41	39

Table 4 indicates that female students in the control group have a pretest MAA=43 and a posttest MAA=58 with MAA gain = 15. Also, female students in experimental group have a Pretest MAA =41 and a posttest MAA= 80 with a MAA gain =39. The MAA gain of students in experimental group, tested with guided multiple choice objective questions is higher than the MAA gain of female students in the control group, tested with unguided multiple choice objective questions. This implies that guided multiple choice objective questions test enhanced the academic achievement of female students more than the unguided type in secondary schools in the rural area, to an appreciable extent.

Research Question 5
How has guided multiple choice objective questions test enhanced academic achievement of male students in secondary schools in rural area?

Answer to Research Question 5
The answer to research question 5 is as shown in table 5.
Table 5: A Comparative Pretest-Posttest Mean Academic Achievement Analysis of SS 2 Male Students in Schools in Rural Area

SS2 MALE STUDENTS IN RURAL AREA	N	POSTTESTED MAA	PRETESTED MAA	MAA GAIN
Control	114	62	49	13
Experimental	62	88	46	42

Table 5 shows that SS2 male students in rural secondary schools in experimental group, tested with guided multiple choice objective questions, have Posttested MAA =88, while their counterparts tested with unguided multiple choice objective questions, have MAA= 62. The MAA gain of 42 obtained by students in the experimental group is, by far, greater than MAA gain of 13 achieved by students in the control group. This indicates that guided multiple choice objective questions test enhanced, to a great extent, higher academic achievement of students than the unguided type.

Research Question 6
How has guided multiple choice objective questions test enhanced academic achievement of female students in secondary schools in urban area?

Answer to Research Question 6
The extent which guided multiple choice objective questions test enhanced academic achievement of female students in urban area is as shown in table 6.
Table 6: A Comparative Pretest-Posttest Means Academic Achievement analysis of SS2 Female Students in Urban Schools

SS2 FEMALE STUDENTS IN URBAN SECONDARY SCHOOLS	N	POSTTESTED MAA	PRETESTED MAA	MAA GAIN
Control	57	60	51.8	8.2
Experimental	88	92	53.2	38.8

Table 6 shows that SS2 female students in the experimental group have Posttested MAA=92 when tested with guided multiple choice objective questions than the SS2 female students in the control group that have a lower Posttested MAA = 60 when tested with unguided multiple choice objective questions. Also the SS2 female students in the experimental group have a higher MAA gain =38.8 than their counterparts in the control group with MAA gain of 8.2. Therefore, this implies that, guided multiple choice objective questions test enhances academic achievement of the SS2 female Students in Senior School Mathematics, to a very great extent, than unguided multiple choice type in the urban secondary schools.

Research Question 7
How has guided multiple choice objective questions test enhanced academic achievement of male students in Senior School Mathematics in urban secondary schools?

Answer to Research Question 7
The extend which guided multiple choice objective questions test enhanced academic achievement of male students in Senior School Mathematics in urban secondary schools is as indicated in table 7.

Table 7: Pretest–Posttest Mean Academic Achievement Analysis of SS2 Male Students in Senior School Mathematics in Urban Secondary Schools

MALE STUDENTS IN URBAN SECONDARY SCHOOLS	N	POSTTESTED MAA	PRETESTED MAA	MAA GAIN
Control	113	68	54	14
Experimental	62	96	50	46

Data in table 7 show that SS2 male students in the experimental group scored a higher MAA=96 than the SS2 male students in control group with MAA=68. Similarly, the MAA gain (46) of SS2 male students in the experimental group is, very much, greater than the MAA gain (14) of SS2 male students in the control group. This, therefore, indicates that students have higher academic achievement when expose to guided multiple choice objective questions test than when exposed to unguided multiple choice objective questions test in Senior School Mathematics Examination in the urban secondary schools.

Research Question 8
How has guided multiple choice objective questions test enhanced the academic achievement of SS2 students in rural secondary schools vis-à-vis SS2 students in urban secondary schools?

Answer to Research Question 8
The extent which guided multiple choice objective questions test enhanced the academic achievement of SS2 students in the rural secondary schools vis-à-vis their counterparts in the urban secondary schools is as shown in table 8.

Table 8: Pretest-Posttest Mean Academic Achievement Analysis of SS2 Students in Rural and Urban Secondary Schools in SS Mathematics

SS2 STUDENTS' SCHOOL LOCATION	N	POSTTESTED MAA	PRETESTED MAA	MAA GAIN
Rural	150	84	49	35
Urban	150	87	51	36

Data in table 8 show that SS2 students in both rural and urban secondary schools have posttested MAAs of 84 and 87, respectively, when tested with guided multiple choice objective questions. This indicates a MAA difference of 3 in favor of SS2 students in urban schools. When pretested with unguided multiple choice objective questions, both SS2 students in rural and urban schools scored MAAs of 49 and 51, respectively, the MAA gains of the students in both rural and urban schools are 35 and 36 , respectively. This implies that, irrespective of the location of the school, guided multiple choice objective questions test enhances higher academic achievement more than unguided multiple choice objective questions test.

Testing of Null Hypotheses
In order to retain or reject the eight null hypotheses posted in this study, they were tested at 0.05 level of significance on a 2-tailed test using percentages and Z-test statistics.

HO_1: There is no significant difference between the academic achievement of SS2 students exposed to guide and unguided multiple choice objective questions tests in Senior School Mathematics.

MAA of SS2 students in the control and experimental groups were subjected to z-test analysis as shown in table 9. This was to ascertain whether the difference in MAA was significant or not.

Table 9: Z-test Analysis of MAA of SS2 Students Exposed to Guided and Unguided Multiple Choice Objective Questions Tests in Senior School Mathematics

Group of SS2 Students	N	MAA	SD	df	Z_{cal}	Z_{crit}	P
Control	340	68	10	638	27.96	1.96	<0.05
Experimental	300	89	9				

Data in table 9 show that $Z_{cal} = 27.96 > Z_{crit} = 1.96$. Therefore, HO_1 is rejected. This implies that the difference in MAA is significant in favor of the students in the experimental group, exposed to guided multiple choice objective questions test.

HO_2: There is no significant difference between the academic achievement of SS2 students exposed to guided

and unguided multiple choice objective questions tests in Senior Secondary School Mathematics in schools in rural area.

MAA of SS2 students in Secondary Schools in rural area exposed to guided and unguided multiple choice objective questions tests in Senior School Mathematics were subjected to Z-test analysis, as shown in table 10, to know if the difference in MAA was significant or not.

Table 10: Z – test Analysis of MAA of SS2 Students in Secondary Schools in Rural Area Exposed to Guided and Unguided Multiple Choice Objective Questions Tests in Senior School Mathematics

SS2 Students in Schools in Rural Area	N	MAA	SD	df	Z_{cal}	Z_{crit}	P
Control	170	51	6.8	318	48.16	1.96	< 0.05
Experimental	150	86	6.2				

Data in table10 show that $Z_{cal} = 48.16 > Z_{crit} = 1.96$. This means that the difference in MAAs between the students in the control and experimental groups is significant in favor of the students in the experimental group, exposed to guided multiple choice objective questions test. Therefore, HO_2 is rejected.

HO_3: There is no significant difference between the academic achievement of SS2 students exposed to guided and unguided multiple choice objective questions tests in Senior School Mathematics in secondary schools in urban area.

The MAA of SS2 students in secondary schools in urban area exposed to guided and unguided multiple choice objective questions tests in Senior School Mathematics were subjected to z-test analysis, as shown in table 11, to know if the difference in MAA is significant or not.

Table 11: z-test Analysis of MAA of SS2 Students in Schools in Urban Area Exposed to Guided and Unguided Multiple Choice Objective Questions Tests in Senior School Mathematics

Group of ss2students in school in urban area	N	MAA	SD	df	Z_{cal}	Z_{crit}	P
Control	170	55	6.3	318	50.16	1.96	< 0.05
Experimental	150	91	6.5				

From the z-test analysis in table 11, $Z_{cal} = 50.16 > Z_{crit} = 1.96$. The implications are that the difference in MAAs between the students in the control and experimental groups is significant and that this difference in MAAs is in favor of students in the experimental group, exposed to guided multiple choice objective questions test. Another implication is that HO_3 is rejected, while the alternate hypothesis is accepted.

HO_4: There is no significant difference between the academic achievement of SS2 Female students exposed to guided and unguided multiple choice objective questions tests in senior School Mathematics in secondary schools in rural area.

The MAA of SS2 Female students in secondary schools in rural area exposed to guided and unguided multiple choice objective questions tests in Senior School Mathematics were subjected to z-test analysis, as shown in table 12, in order, to ascertain if the difference in MAA was significant or not.

Table 12: Z-test Analysis of MAA of SS2 Female Students in Schools in Rural Area Exposed to Guided and Unguided Multiple Choice Objective Questions Tests in Senior School Mathematics

SS2 Female Students in Schools in Rural Area	N	MAA	SD	df	Z_{cal}	Z_{crit}	P
Control	56	58	5.6	142	22.19	1.96	< 0.05
Experimental	88	80	6.1				

Z-test analysis in table 12 shows that there is a significant difference in MAA between the students in the control and experimental groups, since $Z_{cal} = 22.19 > Z_{crit} = 1.96$. The difference in MAA is, therefore, in favor of the students in experimental group, exposed to guided multiple choice objective questions test, that had a higher MAA =80. The implication is that HO_4 is rejected, while the alternate hypothesis is accepted.

HO_5: There is no significant difference in academic achievement between SS2 male students exposed to guided and unguided multiple choice objective questions tests in Senior School Mathematics in Secondary schools in rural area.

The MAA of SS2 male students in secondary schools in rural area exposed to guided and unguided multiple choice objective questions tests in Senior School Mathematics were subjected to z-test analysis , as shown in table 13, so as, to find out if the difference in MAA was significant or not.

Table 13: Z-test Analysis of MAA of SS2 Male Students in Secondary Schools in Rural Area Exposed to Guided and Unguided Multiple Choice Objective Questions Tests in Senior School Mathematics

SS2 Male Students in School in Rural Area	N	MAA	SD	df	Z_{cal}	Z_{crit}	P
Control	114	62	8.0	174	20.27	1.96	< 0.05
Experimental	62	88	8.2				

Data available in table 13 indicate that $Z_{cal} = 20.27 > Z_{crit} = 1.96$, implying that the difference in the MAA between the students in control and experimental groups is significant in favor of the later, exposed to guided multiple choice objective questions test. **HO_5** is, therefore, rejected, while the alternate hypothesis is, hereby, retained.

HO_6: There is no significant difference in academic achievement between SS2 female students exposed to guided and unguided multiple choice objective questions tests in Senior School Mathematics in secondary schools in urban area.

The MAAs of SS2 female students in secondary schools in urban area exposed to guided and unguided multiple choice objective questions tests in Senior School Mathematics were subjected to z-test analysis, as shown in table 14, in order, to know if the difference in MAA was significant or not.

Table 14: Z-test Analysis of MAA of SS2 Female Students in Schools in Urban Area Exposed to Guided and Unguided Multiple Choice Objective Questions Tests in Senior School Mathematics.

SS2 Female Students in Schools in urban area	N	MAA	SD	df	Z_{cal}	Z_{crit}	P
Control	57	60	8.3	143	22.04	1.96	< 0.05
Experimental	88	92	8.9				

Z-test analysis of MAAs of SS2 female students in control and experimental groups, as shown in table 14 indicates that $Z_{cal} = 22.04 > Z_{crit} = 1.96$, implying that the difference in MAA is significant in favor of the students in the experimental group , exposed to guided multiple choice objective questions test, that had a higher MAA= 92. Therefore, **HO_6**: is rejected, while the alternate hypothesis is retained.

Ho_7: There is no significant difference in academic achievement between SS2 male students exposed to guided and unguided multiple choice objective questions tests in Senior School Mathematics in Secondary Schools in Urban Area.

The MAAs of SS2 male students in Secondary Schools in urban area exposed to guided and unguided multiple choice objective questions tests in Senior School Mathematics were subjected to z-test analysis, as shown in table 15, in order, to find out whether there was significant difference in the MAAs.

Table 15: Z- test Analysis of MAA of SS2 Male Students in Secondary Schools in Urban Area Exposed to Guided and Unguided Multiple Choice Objective Questions Tests in Senior School Mathematics

Group of SS2 male students in schools in urban area	N	MAA	SD	df	Zeal	Zerit	P
Control	113	68	8.0	173	22.45	1.96	< 0.05
Experimental	62	96	8.4				

Data in table 15 show that $Z_{cal} = 22.45 > Z_{crit} = 1.96$, indicating a significant difference between MAAs of SS2 male students in the control and experimental groups in urban area, in favor of the later, exposed to guided multiple choice objective questions test. Therefore, **HO_7** is, hereby, rejected, while its alternate hypothesis is retained. This implies that guided multiple choice objective questions test is a better test instrument than the unguided type, in terms of enhancement of academic achievement of students in urban area.

HO_8: There is no significant difference between the academic achievement of SS2 students in rural and urban secondary schools exposed to guided multiple choice objective questions test in Senior School Mathematics.

The MAAs of SS2 students in rural and urban secondary schools exposed to guided multiple choice objective questions test in Senior School Mathematics were subjected to z-test analysis, as shown in table 16, to find out if the difference in MAA was significant or not.

Table 16: Z-test Analysis of MAA of SS2 Students in Rural and Urban Schools in Senior School Mathematics Exposed to Guided Multiple Choice Objective Questions Test

Ss2 students school location	N	MAA	SD	df	Z_{cal}	Z_{crit}	P
Rural	150	84	9.0	298	1.89	1.96	< 0.05
Urban	150	86	9.3				

Data in table 16 confirm that $Z_{cal} = 1.89 < Z_{crit} = 1.96$, showing no significant difference in MAA scores of the SS2 students in Secondary Schools in both rural and urban areas. The **HO_8** is, therefore, retained. The implication is that students whose schools are located in both rural and urban areas, exposed to guided multiple choice objective questions test, have almost equal enhancement in their academic achievements in the Senior School Mathematics.

Summary of the findings

This study investigated the effect of guided multiple choice objective questions test on academic achievement of SS2 students in Senior School Mathematics .The following findings were prominent.

The SS2 students exposed to guided multiple choice objective questions test have higher posttested Mean Academic Achievement in the Senior School Mathematics than the SS2 students exposed to unguided multiple choice objective questions test. Besides, in all cases, students exposed to Guided Multiple Choice Objective Questions Test (GMCOQT) have higher Mean Academic Achievement Gain than their counterparts exposed to Unguided Multiple Choice Objective Questions Test (UGMCOQT). The difference in the posttested MAA of both categories of SS2 students, control and experimental, was statistically significant.

The SS2 students in urban and rural schools exposed to guided multiple choice objective questions test have a very high appreciable MAA gain. The difference in the MAAs of these categories of SS2 students shows

no statistical significant difference.

Discussion of the findings

The purpose of this study was to find out the effect of guided multiple choice objective questions test on academic achievement of students in Senior School Mathematics, by school location, in Delta State Capital Territory of Nigeria. The discussion was done in order of research questions and hypotheses guiding this study.

The findings shown in tables I, 2, 3,4,5,6,7and 8 indicated higher posttested MAA of SS2 students exposed to guided multiple choice objective questions test than their SS2 counterparts exposed to unguided multiple choice objective questions test. This was found to be significant when subjected to statistical test, as shown in tables 9,10,11,12, 13, 14 and 15. This agrees with the finding of Igbojinwaekwu (2012) who affirms that Senior School Students exposed to guided multiple objective questions test had higher performance than those exposed to unguided multiple choice objective questions test in Senior School Oral English Examination. This finding, also, agrees with Ndu, (1999) who asserted that unguided multiple choice objective questions test breeds regurgitation of facts, memorization, low academic achievement and against application of facts, while guided multiple choice objective questions test encourages fast recall of facts, application of knowledge and high academic achievement of students in Senior School Examinations. This might be due to the fact that the guided questions led the students to the correct answers, without much difficulty, unlike the unguided type.

Another vital finding in this study is the high academic achievement of SS2 students exposed to guided multiple choice objective questions test, irrespective of the school location, as found in table 16. Simply put, students in both urban and rural schools equally had very high academic achievement, after they had been exposed to guided multiple choice objective questions test. This shows that this test instrument is not location bias. This finding is, however, not in alignment with the finding of Odo (1999) who confirmed in a study, that school location is causes of students' difficulty in secondary school geometry. This might be because the students used in Odo's study might have been exposed to unguided multiple choice objective questions test or that the teachers used during teaching-learning, in course of his research, did not undergo adequate training.

Implications for Practice and Future Research

One of the findings of this study, worth mentioning, is that SS2 students exposed to guided multiple choice objective questions test have appreciable significant higher mean academic achievement than the SS2 students exposed to unguided multiple choice objective questions test. This implies that teachers worldwide should imbibe the culture of using guided multiple choice objective questions test in continuous assessment and terminal examinations, in order, to drastically reduce the high rate of failure. They should, as a matter of urgency, discard unguided multiple choice objective questions test, which is a miss-match to the present day Information and Communications Technology (ICT).

The finding of no-significant higher mean academic achievement of SS2 students, irrespective of school location (either in urban or rural areas), when exposed to guided multiple choice objective questions test, implies that no matter the school location, teachers are free to use this test instrument, if they expect high academic achievement from the students. This, also, implies that the test instrument is not location bias, so long as the students are properly taught before the assessment.

This research can be replicated in other subjects and in other countries, in order, to find out whether the findings in this study are applicable to other subjects and countries. Besides, this study can be carried out in Junior Secondary Schools in Nigeria to ascertain if the findings in this study in Senior Secondary Schools are applicable to their findings in Junior Secondary Schools.

Conclusion

Guided multiple choice objective questions test enhanced, to a very great extent, a very high and significant academic achievement of SS2 Students than the unguided type. There was no-significant difference between the high mean academic achievement of SS2 students in Urban and rural secondary schools exposed to guided multiple choice objective questions test.

Recommendations

The researcher, therefore, has the following recommendations:

a) teachers should make use of guided multiple choice objective questions test when assessing students,
b) teachers should be given adequate training on generating guided multiple choice objective questions and
c) examining bodies should supply all the formulae needed in Mathematics Examinations to students, in order, to support the use of guided multiple choice objective questions test and applications of knowledge, rather than memorization and regurgitation of facts.

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