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Guided Scoring: A Panacea for Effective Implementation of Continuous Assessment Programme and Enhancing Students' Academic Achievements on Mathematics.

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Abstract
This study investigates the effect of guided scoring instructional strategy on performance of secondary school students in mathematics. Also the differences in the number of assessments administered and marked with the use of guided scoring and without its use were examined. The design of the study is quasi-experimental utilizing pre-test post –test non equivalent group. A sample of three hundred and thirty six senior secondary class one students were selected from three school types in Umuahia education zone of Abia State with experimental and control groups constituted in each school. Data obtained from pre-test and post –test were statistically analyzed using Analysis of Covariance (ANCOVA). With gain scores of -1.99 and 20.26 (40.8%) for Control and Experimental groups respectively, the work indicates that Guided Scoring improved the problem solving skills of students and enhanced their performance in Mathematics. The F-ratio of 398.808 is shown to be significant at 1% level, further confirming that students exposed to guided scoring instructional strategy significantly out performed those who were not exposed to the strategy. Also the teacher administered and marked more continuous assessments with the use of guided scoring with a total score of 12 for control group and 20 for experimental group. The findings of this study will help lessen the burden of continuous assessment on teachers, increase the frequency of continuous assessment and thereby improve efficiency in teaching and learning of mathematics. This study will also help to expose students to the criteria by which they are judged and in the development of their judgment skills. The researcher recommends the adoption of guided scoring in secondary school systems and tertiary institutions as an efficient way of implementing the continuous assessment programme and enhancing the performance of students in Science, Technology and Mathematics.
Keywords: Guided Scoring, Instructional Strategy, Implementation, Continuous Assessment, Enhancing, Academic Achievement, Mathematics.

Introduction

The development of any modern society leans heavily on its Science, Technology and Mathematics. Mathematics is the foundation for any meaningful scientific endeavour and any nation that must develop in science and technology must have a strong mathematical foundation for its youths. In this regard Chimo and Joshua (2005) described mathematics as the queen as well as the handmaid, the master and servant of the sciences because of the leadership and service role it plays. Also Aburime (2004) recognized competence in mathematics as a critical determinant of the post –secondary educational and career options available to young people. In the business circle one needs an acceptable aptitude in mathematics to avoid pit falls and miscalculations that would result to business losses. Business transactions involve one form of calculation or the other and the level of sophistication in today's business world requires that a business man of today needs to be fairly literate in mathematics.

It is however disheartening to observe that performance of students in mathematics at junior and senior secondary school certificate examinations are far below expectation. This fact is buttressed by Aburime (2004) who remarks that "for more than twenty years, secondary school mathematics results have been persistently poor in Nigeria. This chronic poor achievement in mathematics appears to defy every attempt to cure or even control". The results of senior school certificate examination for 2012 and 2013 published by West African Examination Council also indicated poor performance of students in mathematics

One is left to wonder on what could be the possible causes of these poor achievements of students in mathematics and the feasible ways of improving the performance. According to Uhumuavbi and Umoren (2005) performance of students is affected by many factors such as the instructional method/strategy, environment, and attitude of student towards the subject among others. It is also suspected that in mathematics students do not have adequate knowledge on the process of allocating marks in script grading process and therefore are unable to clearly show the important steps in their solution. The scoring of any mathematics test places emphasis on the process, which may differ from individual to individual. Bodies like West African Examination Council (WAEC) and National Examination Council (NECO) in Nigeria adopt systems of marking guides which reveal the importance of the process of arriving at an answer by allocating more marks to the steps taken to arrive at the answer than to the answer itself. Reports of chief examiners of WAEC (2012) confirm that sufficient marks were

awarded to the methods and steps at solving problems. Three categories of marks awarded during script grading are Method Mark (M), Bonus Marks (B), and Accuracy dependent on Method (A). Method Marks (M) are given for the use of correct method. The correct method should lead to the correct answer if there are no numerical errors or miscalculation. Accuracy Marks (A) are earned when the answer is correct as given in the marking scheme, when the method mark is zero, the immediate accuracy marks are also lost. Bonus Marks (B) are awarded for correct accuracy marks. Bonus marks combine both method and accuracy marks together. Follow through bonus marks are awarded in special situations where the candidate's wrong values are used correctly in the subsequent working. Example is in ploting candidate's wrong values in drawing a graph. Many mathematics students are ignorant of these categories of marks, and either tend to skip vital steps in their curious effort to arrive at an answer and/or waste useful time in providing irrelevant and unwanted details. This emphasis on process has made it expedient for mathematics teachers to fully adopt the problem solving method of teaching and to help students develop their abilities in this direction. The students need to be intimated and assisted to get used to the rules observed in script grading process by evaluation bodies.

According to FRN (2004), the National policy on education stipulates that "educational assessment and evaluation shall be liberalized by their being based in whole or in part on continuous assessment of the progress of the individual". To this end frequent assessment of students is required in the school system. This should be accompanied by constant provision of feedback on progress (that is,. areas of strengths and weaknesses) of individual students and corrective measures to assist the children. Doublelist (2013) enumerated the factors that inhibit the implementation of continuous assessment to include insufficient time for teaching and assessment and large class size. To operate continuous assessment effectively, the teacher needs to spend time on each child. Therefore the teacher needs to teach fewer number of students per class to enable him or her teach, assess and provide feedback on the children individually. The implication is that large number of students per class will make it difficult for a teacher to teach and evaluate pupils effectively. Hence, continuous assessment takes much of the teacher's time because a good deal of their time is spent in writing, marking and recording results. Chimo and Joshua (2005) confirmed that there are not enough mathematics teachers in our secondary schools, so the few available ones are over laboured. This makes it difficult for the teacher to give homeworks for students extra practice and when they do, they may not have enough time to mark such assignments. Evidently, continuous assessment in mathematics seems to be a burden to the teacher because of the increased work load due to scarcity of mathematics teachers. The idea of marking each script by the teacher and showing each student where s(he) went wrong in the process is too cumbersome, time consuming and practically impossible to a mathematics teacher. These practices only leave the students confused and results to low achievement in the subject. It also frustrates effective implementation of continuous assessment programme and tends to defeat the aim of the programme. Hence, there is need to develop an instructional strategy that will aid the implementation of continuous assessment in secondary schools.

This study therefore investigates the effect of guiding students to score their assessment papers on their performance in mathematics. Specifically, the differences in the performance of students who are exposed to 'guided scoring' and those who are not exposed to the strategy are examined. Also the number of assessments the teacher was able to administer and mark for students who used guided scoring and those who did not use the strategy was investigated.

Statement of the Problem

The problem of this study is to investigate if the instructional strategy of the teacher guiding students to score their continuous assessment exercises / tests would increase the frequency of assessment given by teachers and/or enhance the performance of students in mathematics.

Research Questions.

i) How effective is guided scoring strategy (GSS) in improving problem solving skills of students in mathematics?
ii) To what extent could guided scoring strategy enhance the performance of students in mathematics?
iii) What is the number of assessments administered and marked in the experimental and control groups?

Research Hypothesis

Ho: There is no significant difference in the performance of students who used guided scoring and those who did not use guided scoring strategy.

The Concept of Guided Scoring Strategy

Guided scoring strategy (GSS) is an instructional strategy whereby the teachers (after instruction) guide the students to score their continuous assessment papers during class works, assignments and tests. The teacher

draws the marking scheme, discusses the scheme with the students and instructs them on the steps where marks should be awarded and the marks to be awarded at each step. "Guided Scoring" is derived from two concepts – guided inquiry or discovery method and scoring. Scoring is defined as the process of assigning numbers or points to the responses of testees on test items (Mkpa 1992). Inquiry on the other hand is a form of teaching which stresses the finding out of things so that "warranted assertion" can be made (Vikoo, 2003).

Some research works have been carried out to determine the efficacy of guided inquiry. For instance, Ibe (2006) conducted a research on Breaking Gender Barriers on Achievement in Science and Technology and Mathematics using hands on minds on (guided inquiry), and his result reveals that students who were taught Biology using guided inquiry performed better than those who were taught the subject using conventional (expository) method. In a similar inquiry by Mboto and Ogar (2004) using a sample of 120 students constituted into experimental and control groups, a t-test comparison of means of post test scores of the two groups showed that guided laboratory is more effective in the retention of physics concepts than the expository approach. Using data collected from a sample of 120 Senior Secondary Class Two (SS2) students drawn from co-education schools in Federal Capital Territory (FCT) Abuja, Oragwan (2000) studied the effect of guided scoring strategy on the performance of students in mathematics. The result of his data anaylsis using t-test technique clearly demonstrates that students performed better in mathematics problem solving if guided scoring was used as instructional strategy. Similarly, Mkpa and Ihendinhu (2008) studied the effects of guided scoring strategy on performance of secondary school students in mathematics in Abia State of Nigeria. Data were collected on a sample of 126 SS1 students drawn from single sex school (all boys). The result of data analysis using t-test also indicated that guided scoring affects the performance of students in mathematics positively.

There is need to investigate the efficacy of guided scoring using data collected from both single sex schools and coeducational schools. Also analysis of covariance (ANCOVA) ought to have been used to analyze data in the above studies, since there was no pure randomization of subjects for the experimental works. This will help accommodate initial differences in the subjects prior to the experiments. This study sets to fill these identified gaps by dealing with these methodological pitfalls.

Methodology

The quasi- experimental study approach utilizing pretest posttest non-equivalent control group design was adopted. A sample of 336 senior secondary class one students was selected from a population of 1,357 using both probability and non-probability sampling techniques. Purposive or judgmental sampling was used to select the local government areas and schools for the experiment. Simple random sampling and area or cluster sampling (probability) was used to select the classes for the experiment. Any student belonging to the chosen streams or classes automatically becomes a subject for the experiment. Furthermore, balloting was used to assign each of the selected classes to experimental and control groups.

Instruments for Data Collection

Two instruments were used to collect data in the experiment. They are:

- Mathematics Instructional Package (MIP)
- Mathematics Achievement Test (MAT)

An instructional package was designed by the researcher from six selected topics in SS1 scheme of work. In selecting these topics the researcher ensured that only the topics in SS1 scheme of work which the students have not been exposed to be used. In designing these topics in the package, the researcher specified the extent of coverage of the contents and suggested possible steps to be followed during instruction. Included in the package is a group of assessment questions given as class works, assignments and tests.

The other instrument for data collection is a mathematics achievement pretest and posttest. The researcher constructed ten essay questions for a pretest while twelve essay questions were constructed and used for posttest. The scores of the students in the pretest and posttest formed a major source of data for the study.

The instructional package, mathematics achievement tests and marking guides were validated by three teachers of mathematics and two lecturers from measurement and evaluation. The mathematics achievement tests were administered to a sample of 30 SS2 students who had studied the topics for the experiment on two occasions with two weeks interval. These students were drawn from a co- educational school situated in the same area but not used as one of the schools for the experiment. Copies of the scripts of the 30 students were photocopied and scored by the researcher and two other mathematics teachers. The scores awarded by the ratters were analyzed using Kendall's Coefficient of Concordance (W) to measure the degree of agreement among the rates. A reliability coefficient of 0.93 was obtained. The coefficient of stability of the instruments was established using Pearson product moment correlation in test retest. The reliability coefficient of 0.87 was obtained.

Treatment Procedure

The researcher constituted experimental and control groups in each of the three schools. Three mathematics teachers (one from each school) were trained by the researcher as research assistants. Each mathematics teacher taught both the control and experimental groups in his /her own school. On completion of topics in the instructional package, the teacher administered the accompanying questions in the package as either class works, assignments or tests to the students.

For the experimental groups, the teacher guided students to score their work in these continuous assessment questions. All the rules observed during script grading by West African Examination Council and National Examination Council were also observed during the exercise. The students however interchanged their exercise books such that no child scored his/her own work. For the control group the teacher scored the continuous assessment questions without revealing the process marks to the students. The pretest and posttest were however scored by the researcher. Scores obtained from the pretest and posttest were statistically analyzed using analysis of covariance to test the null hypothesis whereas descriptive statistics was used to answer the research questions. The duration of the experiment was six weeks made up of four lesson periods per week.

Result of Data Analysis

Research Question One:

How effective is guided scoring strategy in improving problem solving skills of students in mathematics?

This research question was answered by computing the difference between the mean scores of the pre-test and post- test of control and experimental groups as shown in Table 1 below.

Table 1: Mean and standard deviation scores of students in achievement tests.

Details	Control		Experimental	
	Mean	Standard Dev	Mean	Standard Dev
Pre-test	50.23	10.29	49.63	10.20
Post-test	48.24	10.95	69.89	14.14
Gain Score	**-1.99**		**20.26**	

Source: computed using achievement scores of experimental and control groups.

From Table1, the experimental group had a gain score of 20.26 while the control group had a gain score of -1.99.

Research Question Two:

To what extent could guided scoring strategy enhance the performance of students in mathematics?

The percentage increase in performance of students in the experimental group was calculated to provide answer to this question

Table 2: Percentage gain score of students in experimental group

Mean of pre-test	Mean of Post-test	Gain Score	Percentage
49.63	69.89	20.26	40.8

Source: computed using achievement scores of students in experimental group.

The table indicated 40.8 percentage increase in the performance of the experimental group.

Research Question Three:

What is the number of assessments administered and marked in the experimental and control groups?

Table 3: Number of continuous assessments administered and marked in the 2 groups

Group	Wk1		Wk2				Wk3		Wk4				Total
	assignment		assignment		Test		assignment		assignment		test		
	adm	mkd	adm	mkd	adm	mkd	adm	mkd	adm	mkd	adm	mkd	
Control experimental	2 2	1 2	1 2	_ 2	1 1	1 1	2 2	_ 2	2 2	1 2	1 1	_ 1	12 20

Key: Administered 1; Marked 1 Total 20.
Source: computed using continuous assessment books of experiment

From Table 3 above, the experimental group had a total score of 20 while the control group had a total score of 12. Hence guided scoring made it possible for the teacher to administer and mark more continuous assessments**.**

Hypothesis

Ho: There is no significant difference in the performance of students who used guided scoring and those who did not use guided scoring strategy.

In testing this hypothesis, the pre-test and post-test scores of all experimental and control groups from the three schools were collapsed. Analysis of covariance was used to test for significant difference between the adjusted mean scores of the experimental and control groups.

Table 4: Adjusted mean scores of students in control and experimental groups.

Teaching Strategy	Adjusted mean	Standard error	95% confidence interval	
			Lower bound	Upper bound
Control group Experimental	48.024 70.113	0.782 0.782	46.485 68.575	49.562 71.652

Source: Computed using achievement scores of experiment and control groups.

From Table 4, the adjusted mean score of experimental group (70.113) is greater than the adjusted mean score of the control group (48.024). This result suggests better performance by the experimental group. Analysis of covariance was used to test for significant difference in the adjusted mean score and the summary of result is shown in Table 5 below.

Table 5: Summary table for analysis of covariance of the performance of students exposed to guided scoring and control group.

Source	Sum of squares	Df	Mean square	F-cal	F-crit
Contrast Error	40953.257 34195.525	1 333	40953.257 102.689	398.808	3.86

Source: computed using achievement scores of experimental and control groups.

Table 5 shows the effect of treatment (f-calculated) as 398.808, while the corresponding F-critical at 0.05 level of significance is 3.86. The null hypothesis is then rejected and the conclusion is that there is significant difference in the performance of students who used guided scoring strategy and those who did not use the strategy, with students in experimental group out-performing those in control group.

Discussion of Results

Evidence obtained in this study shows that guided scoring as an instructional strategy improves the problem solving skills of students and thereby enhances their performance in mathematics. Also the use of guided scoring instructional strategy enabled the teacher to administer and mark more continuous assessment than could ordinarily be executed by the teacher under the conventional instructional strategy. Hence, guided scoring is an effective tool in the implementation of continuous assessment programme. This result corroborates

the finding of Oragwain (2000) and Mkpa and Ihendinihu (2008) who reported that students performed better if guided scoring was used as an instructional strategy. Their works further stated that teachers felt relieved to give more continuous assessment when guided scoring strategy is adopted. The result also agrees with the finding of Mboto and Ogar (2004) who concluded that guided laboratory is more effective in retention of physics concepts than the expository approach. Furthermore, the result of the present study is consistent with the finding of Ibe (2006) which revealed that students who were taught biology using guided inquiring performed better than those who were taught using conventional (expository) method.

The agreements and consistencies of the above results could be due to the inherent merits of peer assessments. Involving students in assessing their own performance could help.

- Reduce the work load of the teacher
- In the development of their own judgment skills.
- Expose them to the criteria by which they are judged and
- Provide examples of successful performance (National Academic of Science 2000, and East, 2007).

Educational Implications

The findings of this study have implications for the teacher, students and educational administrators. The study has revealed an instructional strategy that can improve the problem solving skills of students in mathematics and thus enhance their performance in the subject. This strategy will no doubt reduce the burden of continuous assessment on teachers, increase the frequency of assessment and improve efficiency in teaching and learning of mathematics.

The result of the present study will also help educational planners /evaluators to realize an effective way of implementing continuous assessment programme in mathematics.

Based on the findings of the study, the researcher made the following recommendations:

1) Mathematics teachers should be encouraged to adopt guided scoring strategy during instructions, all the rules observed during marking exercise by examination bodies should also be observed during assessment in internal examination to expose the students to such rules.
2) Teachers should be encouraged to participate in coordination exercises organized by examination bodies during script grading/marking to update their knowledge on current assessment techniques.
3) Students should be taught the usefulness of guided scoring strategy and encouraged to participate in the exercise during instructions.
4) Educational planners should recommend the adoption of guided scoring as an effective way of implementing continuous assessment programme in mathematics and also recommend its adoption to other subjects in Abia State Secondary School.

Conclusion:

The following conclusions were drawn based on the findings of this study:

- ❖ Guided scoring instructional strategy enhances the performance of students in mathematics.
- ❖ Guided scoring is an efficient tool to be used for effective implementation of continuous assessment programme.

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