

EXPLORING THE ROLE OF GUIDED SCORING INSTRUCTIONAL STRATEGY IN ENHANCING MATHEMATICS ACHIEVEMENT: A SCHOOL-TYPE ANALYSIS

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Abstract

The study investigated the effects of guided scoring instructional strategy (GSIS) on the achievement of secondary school students in mathematics: the school type perspective. Background: When the scoring pattern is guided, it is likely to result in uniformity of scoring of students' work and involvement of students in their own assessment. GSIS may or may not have effect on the school type, since schools are usually either for female only, male only or mixed (coeducational). Aims: The study specifically sought to find out the effects of the GSIS on students based on school type. Methods: The design of the study was quasi-experimental, utilizing pre-test, post-test groups. A sample of 336 senior secondary class one students were chosen from a population of 3,111 from three (3) school types in Owerri municipal council, Imo State, Nigeria. The simple random sampling technique was used for selecting the experimental students while purposive sampling technique was used for selecting the 3 experimental schools. One research question and four hypotheses guided the study. Data obtained from pre-test and post-test were statistically analyzed using mean and analysis of covariance (ANCOVA). Results: The results showed that there was difference in the effects of guided scoring instructional strategy (GSIS) on students in different school types with female school having the highest effect. Conclusion: School type is a factor in students' achievement with GSIS. The strategy was recommended to be used in all school types to enhance secondary school teaching and learning outcomes.

Keywords: Guided scoring instructional strategy (GSIS), Achievement, Secondary school, School type, Mathematics

Introduction

Most of the assessments in secondary schools are summarized by awarding scores to students' exercises or activities. Scoring is essential because it gives clear room for comparison of students' performance. Scores act as a medium of assessment of the extent of performance in relation to stipulated objectives and also in relation to other students' performance. When the scoring pattern is guided, it is likely to result in uniformity of scoring of students' work and involvement of students in their own assessment.

Guided scoring is an instructional approach that completely integrates the learners into the assessment exercise that offers the learners rare opportunity of witnessing their errors and sources of failures in accomplishing the tasks (Adipere, Okpko, Leghemo, Enareigha and Epem, 2021). When used as an assessment and instructional tool, it creates room for the students to be incorporated in scoring evaluation in the classroom (kwok in Adipere

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et al, 2021). Guided scoring instructional strategy (GSIS) is an instructional strategy in which the classroom teacher (after class instruction) guides the students to score their class work, assignments and continuous assessment papers during the class contact time. In this strategy, the teacher draws up a class contact time. The teacher also draws up a class marking scheme, familiarizes it with the students and gives them the necessary instructions on the appropriate marking process and the marks to be awarded. The scripts are interchanged and marked by the students according to the teacher's guidance and instruction. This strategy is linked to the marking scheme method in that it involves drawing up a marking scheme for the exercise. But while the marking scheme method involves only the teachers (assessors). The strategy involves both students and teachers (assessed and assessor) alike.

Mathematics is a subject that its knowledge will help in advancement of any individual in the society. Notwithstanding its importance, several studies have shown evidences of poor performance in the subject. Maberia, Mokgosi and Ramapela (2021) in their study found that the poor performance is attributed to the students' factor such as ill-discipline, language barrier, learners' attitude; as well as teacher factor such as lack of pedagogical content knowledge and skill and lack of professional training. Furthermore, mathematics is a subject that requires steps in their problem solving and the mark usually involves awarding marks to the different steps in arriving at the final answer. In the marking schemes of West African Examination Council (WAEC) and the National Examination Council (NECO), it is evident that marks are allocated more to the process of arriving at an answer than to the final answer itself. This implies that GSIS is essential in the marking of mathematics.

Adipere, Okpko, Leghemo, Enareigha and Epem (2021) investigating the effect of guided diagram scoring teaching strategy on senior secondary class 2 (SS2) students' achievement in biology, found gender to be a significant factor in students' achievement when taught with GSIS. Also, Osuala, Ihediohanma and Urenyere (2018) investigating the effect of guided scoring instructional strategy on the achievement of secondary school students in mathematics: the gender perspective, found that there was no significant difference in the achievement of students by gender. This implies that GSIS may or may not have effect on the school type, since schools are usually either for female only, male only or mixed (co-educational). To investigate the above, this study therefore set out to check if GSIS has effect on the student's achievement based on school type. Also to see if there is significant difference in mean achievement scores of students in the different school types in relation to GSIS.

Research question

1) What are the effects of the GSIS on students based on school type?

Hypotheses

- 1) In the achievement of students exposed to GSIS, school-type is not a significant factor for difference.
- 2) There is no significant difference between the mean achievement scores of students exposed to GSIS in male school type and female school type.

- 3) There is no significant difference between the mean achievement scores of students exposed to GSIS in male school type and co-educational school type.
- 4) There is no significant difference between the mean achievement scores of students exposed to GSIS in female school type and co-educational school type.

Methodology

Quasi-experimental research design was adopted for the study. Pre-test, post-test and control group design was employed. The area of the study was Owerri Municipal with all the secondary schools in the area constituting the population for the study. Then, seven secondary schools, and 3,111 SS1 students from the schools in Owerri Municipal. The sample consisted of 336 senior secondary (SS1) students drawn from three sampled school types. Simple random sampling technique was used to select the experimental group students, while purposive sampling technique was used to select the three experimental schools.

Two instruments were used for collection of data. One is the Mathematics Instructional Package (MIP), an essay type question designed by the researchers from six general topics in the senior secondary school one (SS1) scheme of work. Another is the Mathematics Achievement Test (MAT) used to collect data for pre-test and post-test. The pre-test questions contained 10 essay questions set from the junior secondary school scheme of work which students had already studied and aimed at eliciting the eagerness and readiness for class instruction and learning activities. Post-test questions also contained 10 essay questions constructed from the six topics selected from SS1 scheme of work. Question items 1 and 2 were constructed from the topic "Change of subject formula", question item 3 and 4 were on 'quadratic equations', question items 5, 6 and 7 were on "set theory 1 and 11", question item 8 was set from 'pythagoras theorem', question items 9 and 10 were on 'trigonometry 1'. Scores from the pre-test and post-test administration constituted the major sources of data for the experimental study.

The instruments were face validated using experts from West African Examination Council and measurement and evaluation experts. Reliability of the instruments was ascertained by administering the instruments to 30 students not in the sample using test-re-test reliability. Reliability co-efficient of 0.874 and 0.930 was gotten for the pre-test and post-test respectively.

Treatment and Treatment Procedure

In each of the 3 sampled schools, the researchers used experimental and control groups of student research subjects. One teacher was trained by the researchers from each of the sampled schools as research assistants before taking off on the experiment. A pre-test was administered through the research assistants, and a post-test administered after the instructional experiment within an interval of six (6) weeks, in which four lessons were administered per week to the students. In each of the 3 schools, the sampled students were divided into two (2): One stream received the treatment as the experimental group while the other stream which did not receive the treatment was the control group. As the experiment continued, the research assistants taught both the experimental

and control groups in their schools. Whenever a topic on the instructional package was completed, the corresponding questions will be administered to the students either as class work or class assignment. The experimental group of students will receive the treatment; the treatment was that the research assistant guided the students to score their own class work or class assignment responses. The teacher will discuss the process mark with the experimental group and instructed on the marks to be allocated for each step of the scoring exercise. But the students were made to inter-change their scripts so that none of them will score themselves. The control group was not made to pass through this process. The pre-test and post-test were analyzed using analysis of covariance (ANCOVA).

The researchers made the experimental students to retain their classes and systematically controlled the following experimental variables:

The teacher variable;

The research subject's variable; The subject contamination variable; and the statistical-tool variable.

Control of the teacher variable was affected by using the same teacher for the experimental group and the control group in each of the sampled schools, but using different strategies for them. The research subjects' variable was controlled by the researchers through using only secondary schools that were within the Urban Area which have similar circumstances and similar academic environments. The researchers controlled the subject contamination variable by keeping the research subjects ignorant of the fact that an experiment was going, as they were seeing their classroom teacher doing everything. The school normal time table took care of the possibility of overlapping lesson periods. The researchers ensured that there was grading uniformity by personally scoring the pre-test and post-test.

The research question was answered with the aid of the mean statistics while the hypotheses were tested using the analysis of covariance (ANCOVA). Where there are significant differences between treatment groups, the researchers' used post-hoc pair-wise comparison of adjusting means to locate the differential effectiveness and tested with the Bon-ferroni procedure.

Result and Discussion

Research Question

What are the effects of the GSIS on students based on school type?

Table i: Mean and standard deviation of students' performance relating to school-type.

School type	N	Mean	Adjusted mean	Mean means of	Standard deviation
Male	63	73.97	72.93	73.45	13.50
Female	50	76.88	73.75	75.32	12.90

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Co-educational	55	58.87	62.92	60.90	8.35
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From the above table, it is evident from pre-test and post-test means that there is difference in the effects of guided scoring instructional strategy (GSIS) on the students with female school having the highest effect of 75.32 average, followed by students in the male school (average of 73.45) and then the co-educational (60.90 average) type of school.

Hypothesis One

In the achievement of students exposed to GSIS, school-type is not a significant factor for difference.

The hypothesis was tested by analyzing data collected from pre-test and post-test of experimental groups in the three (3) school types (male type, female type and co-educational). The adjusted means of schools A (male type), B (female type) and C (co-educational) are shown in the table below.

From the table above, the adjusted mean scores of school A, B and C are 72.925, 73.745 and 62.918 respectively, indicating that the adjusted mean $B > A > C$. This reveals differences in the mean for different schools which is an indication school type can be a factor in students' achievement with GSIS. The researchers further carried out Analysis of covariance to test for significant difference among the adjusted means. The result of the ANCOVA is presented below:

Table iii: Summary table for analysis of covariance of achievement of students who were exposed to guided scoring strategy based on school type.

Source	Sum of squares	d.f.	Mean square	F-cal	F-critical
Contrast	3312.369	2	1656.184	16.395	3.06
Error	16566.584	164	101.016		

From the table above, the F-cal of 16.395 is greater than the F-critical of 3.06, hence the null hypothesis was rejected. This implies that there is significant difference in the achievement of students who were exposed to guided scoring strategy due to school type.

Hypothesis Two

There is no significant difference between the mean achievement scores of students exposed to GSIS in male school type and female school type.

Table iv: Summary table for analysis of covariance of pair-wise comparison of male school type (A) and female school type (B)

Source	Sum of	d.f.	Mean square	F-cal	Probability (P)
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	squares				
Contrast	18.427	1	18.427	0.182	0.670
Error	16566.584	164	101.016		

From the table above, probability $P = 0.670 > 0.0167$. This result indicated that there was no significant difference in the adjusted means between male type schools and female type school.

Hypothesis Three

There is no significant difference between the mean achievement scores of students exposed to GSIS in male type school and co-educational type school.

Table v: summary table for analysis of covariance of pair-wise comparison of male type school (A) and co-educational school (C).

Source	Sum of squares	d.f.	Mean square	F-cal	Probability (P)
Contrast	2628.283	1	2628.283	26.118	0.000
Error	16566.584	164	101.016		

From the table above, probability $P = 0.000 < 0.0167$. The result indicated that there was significant difference between the adjusted means of male type school and co-educational type school. The implication is that students from single sex (all male) school performed significantly better than their counterparts in co-educational school.

Hypothesis Four

There is no significant difference between the mean achievement scores of students exposed to GSIS in female type school and co-educational type school.

Table vi: summary table for analysis of covariance of pair-wise comparison of female type school and co-educational type school.

Source	Sum of squares	d.f.	Mean square	F-cal	Probability (P)
Contrast	2551.633	1	2551.633	25.260	0.000
Error	16566.584	164	101.016		

The result from the above table gave $P = 0.000 < 0.0167$. This implies that there is significant difference between the adjusted means of female type school (B) and co-educational type school (C). The result indicates that single sex school (all female) also performed better than their counterparts in co-educational school.

School type and academic performance of students in Mathematics:

Data collected to investigate the differences in the performance of experimental groups in these school types were analyzed descriptively and inferentially and the results of the investigations are shown in the above tables.

From table i, the adjusted mean of school A is 72.925, school B is 73.745 and school C is 62.918, which means that the mean of $B > A > C$. From table 3, f-calculated (16.395) was greater than f-critical (3.06), therefore the null hypothesis was rejected. The implication of this result is that there is significant difference in the performance of students from experimental groups in the three schools. Furthermore, analysis of post-hoc pair-wise comparison of the adjusted means was carried out. The comparison of male type school (A) and female type school (B) in table 4 gives a probability of 0.670. This value is greater than the Bon-feroni value of 0.0167 indicating that there is no significant difference between the performance of students from male type school (A) and those from female type school (B). Furthermore, pair-wise comparison of male type school (A) and co-educational school (C) in table v gave a probability of 0.000 which is less than 0.0167. This indicated that there is significant difference between the performance of students from male type school (A) and co-educational school (C). Similarly, from table vi, a comparison of female type school and co-educational school gives a probability of 0.000 which is less than 0.00167, indicating the existence of significant difference between the performances of students from female type school and co- educational school.

The implication of these findings is that although guided scoring strategy affects performance of students in Mathematics positively, the level of its effectiveness differs between single sex schools (A, B) and co-educational school (C). In other words, students from single sex schools benefit more from the strategy than those from co-educational schools.

These results correlated with finding of Hussain (2020) that discovered that Boys and girls from single-sex schools obtain better scores in achievement test and gain better grades than their counterparts in co-educational schools. Similarly, this result is consistent with the finding of Busari (2016) who found out that there is a significant difference between the academic performance of students of co-educational schools and single sex school with the students in the single-sex secondary schools performing better than their counterparts in co-educational schools. Again, the finding of Okafor and Mokwelu (2018) revealed that co-educational schools perform lower compared to single-sex schools since girls do not have equal chances as boys to develop the potentials in co-education schools. These forgoing findings of other researchers support the current findings of this study.

However, the result of the present study contradicts the findings of Yalcinkaya and Ulu (2012) which showed very little difference in academic achievement across schools. The students in the single-sex schools and co-educational schools were found to have similar grade point average. Furthermore, academic performance of male students from single-sex schools and coeducational schools were not significantly different, likewise academic performance of female students in single-sex schools and co-educational schools (Okafor & Mokwelu, 2018).

Some scholars have also pointed out the out-performance of boys by girls. According to Blair in Pendleton (2016), when controlled, girls at all levels of academic's ability do better in single gender schools. Also, Ullah and Ullah (2019) observed that young girls have been dominating boys in terms of educational performance across the globe.

Summary of Findings

1. There was difference in the effects of guided scoring instructional strategy (GSIS) on the students with female school having the highest effect of 75.32 average, followed by students in the male school (average of 73.45) and then the co-educational (60.90 average) type of school.
2. There is significant difference in the achievement of students who were exposed to guided scoring strategy due to school type. Therefore, school type is a factor in students' achievement with GSIS.
3. There was no significant difference in the means achievement score of students in male type schools and female type schools.
4. There was significant difference in the mean achievement score of students in male type schools and co-educational type schools.
5. There is significant difference in the mean achievement score of students in female type schools and co-educational schools.

Recommendations

1. Mathematics teachers should be encouraged to adopt the guided scoring instructional strategy irrespective of school type.
2. Teachers of co-educational schools should be educated on the guided scoring instructional strategy to improve their assessment effectiveness.
3. Stakeholders in education should recommend the adoption of guided scoring instructional strategy as a continuous assessment method in mathematics and other subjects in the secondary school system.

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