

The Relative Effectiveness of Three Evaluation Techniques on Academic Performance of Secondary School Integrated Science Students in Ondo State, Nigeria

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Abstract

This study examined relative effectiveness of three evaluation techniques on academic performance of secondary school students in integrated science (I.SC) in Ondo State, Nigeria. It is a quasi-experimental research of the counterbalanced design type. The 300 students that formed the sample were selected from two purposively selected local government areas from two Senatorial Districts of Ondo State on the basis of rural/urban location. Three schools with three intact classes were selected from each of the rural and urban centers using stratified random sampling technique. Fifty students whose Cumulative Continuous Assessment (CCA) records showed an average score ranging between 30-45 were selected from each intact class using simple random sampling technique. Scores from locally standardized I.SC. Multiple choice achievement test and CCA of the participants between 2009-2011 served as database for the study. Data collected for the study were analysed using ANOVA. The results showed that; there is significant difference in the performance of students exposed to closed book, open book and open time techniques of evaluation learning outcome in I.SC. It also revealed that students' performance in I.SC was better in closed book than open book and open time techniques while open book was better than open time technique. It also showed that interaction of location and evaluating techniques did produce significant effect on secondary school students' learning outcome. Based on the findings, it was recommended that teachers and examining bodies should compliment closed book technique of evaluating learning outcome with open book technique to reduce students' cheating behaviours, anxiety and examination phobia.

Keywords: Relative effectiveness, Closed book, Open book, Open time, Evaluation techniques, Location, interaction, Integrated Science.

1. Introduction

When a programme is put in place and the resources needed to bring the desired output are also made available for the implementation of the programme, such a programme requires monitoring and accountability.

Accountability exists in almost all spheres of business oriented programmes. In rural and urban centres, our day to day activities require accountability. Education is not an exemption. It is an investment and requires accountability. Human and material resources are put in place to ensure qualitative and quantitative output in the education industry in Nigeria. Education managers of the various levels of institution of learning need to give account of the resources utilized in terms of output to the government, parents and the society. Proper and positive accountability requires effective evaluation which involves objective and value judgement. Evaluation as a concept is a judgemental affair. It utilizes tests, measurement and assessment to ensure effective monitoring of academic works to bring about positive decision-making. Alonge (2004) argued that evaluation is a systematic process of determining the extent to which instructional objectives are achieved by pupils. The major and central aim of education is to bring about improve quality in academic standard. Educational accountability as made evaluation of student learning the most important aspect of all the systems approach to instruction.

While Alonge, (2004) and Ajala (2005) argued that all good teaching and learning are not without a continuous process of evaluation, Borishade (1997) opined that it must be realized that the world today is full of decision for and about persons in and around the schools in which evaluation procedures act important role of providing some relevant information. Information about pupils in rural and urban schools are usually obtained through test, measurement and some other assessment techniques such as observation, rating scale and continuous assessment practices.

The past two or more decades had witnessed varied systematic educational evaluation with attention been focused on problems relating to evaluation of instructional programmes, teaching, students' learning processes and even the entire school system. However, students' evaluation has been given more importance. Ajala (2005) stressed that evaluation helps teacher in improving instruction and brings about improved learning among the school children. Ogunsola-Bandele (1995) argued that evaluation has long been in use as tool for making decision in science education. For instance, according to Ogunsola-Bandele (1995) evaluation has been

adopted by thousands of teachers in diagnosing, testing instructional designs and development of curriculum.

Evaluation of students' performance in school subjects in both rural and urban cities has for sometimes taken to adopting variety of forms such as formative, summative, diagnostic and placement which come in the forms of standardized and teacher-made achievement tests. All these forms of evaluation techniques are usually designed in the order of closed book.

In Nigeria, the usual traditional form of evaluation has been closed book technique where students are required to produce answers to a number of questions by recalling information from memory and organizing them to produce and complete answers to the expected number of questions to be answered without prior knowledge of the questions before the examination or reference to any materials relevant to the test instrument during the conduct of the examination. The findings of Ogunsola-Bandele (1995) did not favour the use of this traditional technique (closed book) but argued that students scored higher in the open book technique of evaluating performance. The over dependence on closed book technique of evaluating learning on the part of examiners, the quest for a good certificate/result at all cost and the fear of failure on the part of the students probably contributed greatly to some students' academic cheating behaviour that has become epidemic in all institutions of learning in Nigeria. Other evaluation techniques such as the open book and the open time (take home/ assignment) are available for utilization. Open book technique permits examinee to refer to text materials during examination. It has been contended that open book technique reduces cramming of facts, and assesses the highest level of educational objectives. According to Alonge (2004), it infuses reading culture into students and assess skill of knowing where to find information. In the same vein, open time technique requires examinee to complete the paper of their own time and submit at a specified date. Dunn and Price (2000) has shown that open time technique (Home work/assignment) that permit students to complete assignments under preferred conditions of noise, light, design, mobility and time of the day improved students' achievement, attitude and conduct. Alonge (2004) asserted that this kind of technique of evaluation reduces stress and rote learning. An examination of the submissions of Alonge (2004) on open book and open time techniques of evaluation reveals that both techniques tend to move away from the attitude of rote learning which aims at merely preparing students for examinations but propels students understanding of the concepts of the school subjects which were taught to them.

National Teachers institute (2006) stressed that what most schools in Nigeria are still operating is the traditional rote learning techniques which aimed solely at preparing the students for examinations. Onuka and Onabamiro (2010) argued that this rote learning that is still in operation in Nigeria has gradually eroded and replaced the systematic reading and understanding of the contents of the school subjects. Prior to this century, the use of textbook as means of teaching and learning was held very important. Researcher such as Bassey (1964) has shown that more than sixty percent of university students read about sixty percent of their textbooks before examinations. This, probably, is as a result of teachers preference for the use of textbooks for home works/assignments. Onuka et al (2010) argued that assignment significantly affected students' achievement in mathematics.

Observation revealed that, in the past, Integrated Science is taught to the students by a team of three different specialist teachers (biology, chemistry and physics teachers) and according to Lunzer and Gardner (1979), science teachers then preferred using textbook for home works/assignments rather than using them in classroom transaction. However the evaluation then was based on closed book technique of evaluation. Today in Nigeria, trained and specialized university graduates up to Ph.D level have taken over the teaching of Integrated Science in schools up to university level and especially at the Junior Secondary Schools and university respectively.

Bello (1986) opined that textbook has wider applicability prior lesson, in-lesson and post lesson activities, but Bishop (1961) stressed that in teaching and learning sciences, the textbooks is one of the principal means of spreading knowledge or acquiring information. Textbooks enable students to proffer solutions to the problem given to students in the form of home works/assignments to solve. Take home/assignments provide the opportunity for students to have a deeper knowledge of what the teacher has taught in the class as it permits searching deeper into what was taught in the subject. Ming-Chiti Lan (2003), argued that not only does take home works/assignments provide students the opportunity of mastering what they have been taught in the class, but gave them the privilege to utilize extended time for learning the subject matter after school hour. Researchers (Husen, 1972 and Frederick and Walberg, 1980) argued that the amount of time spent by student on take home works/assignments significantly influenced their school grades, but Owoeye, 2000, Bankole, 2003, Ajayi and Faremi (2004) argued that it was school location (rural and urban areas) that has significant influence on students' learning outcome. Contrary to this, Ajayi (1999) found out that there was no significant difference between the academic performance of students in rural and urban secondary schools. If students were all that attached and committed to reading textbooks in the past and good performance were recorded in examinations, today, reading textbooks has virtually gone into extinction among students and standard of academic

performance has greatly and drastically become reduced among the students, then, it becomes necessary to review the existing use of closed book technique of evaluating learning outcome while the possibility of using open-book or open time (take home/assignment) along side with closed book technique of evaluating students is explored.

2. Statement of the Problem

In Nigeria, it is a known fact that for some time past, there have been complaints from education stakeholders and the public over the general poor standard of academic performance among the students. The pattern of performance of the integrated science students seems not to differ from the performance of other students in other subject disciplines, the reading culture of the students in those glorious days of good academic performance has virtually gone into extinction. The present crop of students are no longer interested in reading for success, however, they seek all crude means including examination malpractice to pass their examinations. The problem of this study, therefore, is over dependent on closed book technique of evaluation and the under utilization of other techniques of evaluation by examiners probably accounted more for the poor standard of academic performance among the students in Nigeria. This study is designed to investigate the effectiveness of closed book, open book and open time techniques of evaluation in determining the academic performance of the integrated science students in Ondo State, Nigeria.

3. Research Questions

Based on the purpose of the study, the following questions were generated to guide the study.

1. Is there any significant difference between the performance of the students in the closed book, open book and open time techniques of evaluating secondary school students in the learning of Integrated Science?
2. Is there any significant interaction effect of school locations (rural and urban centres) and the evaluation techniques of evaluating performance of the students in the learning of Integrated Science?

4. Methodology

This study is quasi-experimental research of the counterbalanced design type that made use of intact classes from schools in urban and rural centres to avert threat arising from differential selection of participants to the internal validity of the experiment (Campbell and Stanley, 1966; Ary, Jacob and Razavieh, 2002, and Coolican, 2009). The target population consisted of all year two junior secondary schools (JSS II) students in Akure South (Ondo Central Senatorial District) and Akoko South West (Ondo North Senatorial District) local Government Areas of Ondo State, Nigeria. The 300 students that formed the sample for the study were selected from two local government areas that were purposively selected from Ondo State on the basis of location (rural/urban area). Three schools were selected from each location using stratified sampling technique. Three intact classes were selected from each of the rural and urban centres. Fifty students whose cumulative continuous assessment (C.A.) record showed an average score ranging between 35-47 were selected from each intact class using simple random sampling technique after teaching all the members of the intact class using conventional teaching method for six weeks. The instrument for the study consisted of 45 items (multiple choice test) generated from an initially constructed 60 items. The initially constructed 60 items (objective) test were drawn from the Ondo State Joint Integrated Science scheme of work for year two of junior secondary school (JSS II). These 60 items were subjected to trial testing using 15 non-participating JSSII students from the Ondo South Senatorial District of Ondo State. The responses of the 15 students were scored and subjected to statistical analysis. Item which its difficulty level and discriminating index did not function as expected on the basis of not failing between 0.3 -0.8 (difficulty level- p -value) and 0.35 – 0.75 (Discriminating power – D - value) were expunged. The scores of the 15 students on the 45 items that fell within the stated P -value and D -value were subjected to Cronbach alpha which yielded a coefficient value of 0.65 and thus ensured the validity of the instrument. The reliability coefficient of the instrument was determined using split-half estimating technique which yielded 'r' coefficient value of 0.76.

5. Procedure

The participants from the rural and urban areas were first given the 45 multiple choice items as take home assignment (open time technique of evaluation). The responses were collected at the end of 48 hours for scoring. Two weeks after, all the participants were re-conveyed for the second and third set of the experiment. All of them were settled down for the closed book techniques of evaluation. The same 45 multiple choice items were administered on the participants for 35 minutes. During this section, the participants were prevented from any form of consultation, discussion with friends or interaction with any text materials. At the end of 35 minutes, the responses were collected from all the participants. All the participants were allowed five minutes break during

which they were permitted to bring out their relevant textbooks which could be of help in answering the questions. All the participants were again given the forty five multiple choice items to answer while they consult their textbooks for answers to the questions. Again the participants were also prevented from any form of discussion or help from colleagues but were encouraged to consult their textbooks. At the end of the thirty five minutes, the responses of the participants were collected. The three sets of script were then scored for the purpose of data analysis. The data collected were subjected to ANOVA using the cumulative continuous assessment scores of the students as covariates, while the multiple classification Analysis (M.C.A.) was carried out in order to identify the relative effectiveness of the three techniques of evaluating students' performance in integrated science among secondary school students.

6. Results

The results of the analysis are as shown in tables 1 and 2.

From table 1, it was shown that the f-calculated value for the main effects of techniques (closed book, open book and open time) of evaluating secondary school students performance in the learning of integrated science 158.734 is greater than the 3.02 table value at 0.05 level of significance, hence, there is significant difference between the performance of students in the closed book, open book and open time techniques of evaluating secondary school students in the learning of integrated science. The table further revealed that the F-calculated value for the effect of interaction between location of schools and techniques of evaluating students' learning of Integrated science was 11.453 which was significant at 0.05 alpha level.

Table 2 showed data on multiple classification analysis (MCA) by school location and techniques of evaluating performance in the learning of integrated science. The table revealed that, with a grand mean of 60.42, performance of students in the closed book technique of evaluating students' performance in the learning of Integrated Science showed the highest adjusted mean score of 63.31, followed by the open book technique and open time technique with adjusted mean scores of 59.51 and 58.42 respectively. The table also indicated that performance in the techniques of evaluating students in the learning of Integrated Science in secondary schools in the rural area had a slightly higher adjusted score (60.34) than their urban counterpart (59.52). In all, it showed a multiple R^2 value of 0.208 and beta values of 0.05 and 0.46 for locations and techniques of evaluating performance respectively.

7. Discussion

The findings of this study revealed that there was significant difference in performance in the techniques of evaluating learning outcome in Integrated Science. The findings of the study showed that techniques of evaluating learning outcome in Integrated science ((closed book, open book and open time) and school location made a difference in evaluation of students learning in Ondo State. Performance of students was better in closed book technique than open book technique. This finding was not in line with the findings of Ogunsola-Bande (1995) that students scored higher grades in open book technique of evaluating students' learning of chemistry. Most of the students combined the right attitude towards closed book technique with the attitude towards open book technique. The testwise students among them answered first those items which they were very sure of the correct answer and later switched over to find answers to items they were not sure of the correct answer from the text book while some of the students who are not testwise opened their text book materials continuously searching for answers to the items throughout the period of administering the test and could not successfully sort out the correct answers to the whole items that constitute the test. The implication of this is that time factor has to be seriously considered in the use of open book technique of evaluating learning outcome. The performance of the students in the open book technique was better than the performance in the open time technique of evaluating learning outcome in Integrated science. This finding disagrees with the findings of Husen, 1972; Frederick et al 1980; Dunn and Price, 2000 and Onuka et al, 2010 that it was open time (assignments) that significantly influence students' achievement/grades, but this finding corroborates the assertion of Alonge (2004) that open book technique of evaluating performance opens the students to reading culture and ability to assess where to find the right information. This result may be due to the handling strategies involved in the supervision of the students. The presence of the examiner during the application of open book technique probably warranted the students to give the test a focused attention and concentration with determination to pass the test whereas the low performance found in the open time techniques maybe due to students' lack of supervision and openness to all forms of distraction. Apart from this, some of the students may not give the assignment a serious consideration and handled it with levity or probably preferred to copy right or wrong materials from a colleague who probably left the working of the assignment to the hand of their brothers or sisters. From this study, it is obvious that open book technique of evaluating learning outcome may drastically reduce if not completely eradicating guessing tendencies in objective test items among students. The finding also showed that school location did not significantly influence students' learning of integrated science as shown by the performance of

the students in the techniques of evaluating performance in integrated science. This finding corroborate the finding of Ajayi (1999) that school location did not produce any significant difference in the performance of students while the finding on interaction effect of location and techniques of evaluating learning revealed that interaction of location and techniques of evaluating learning in integrated science did produce significant effect on the learning outcome of secondary school students in integrated science. This finding supported the finding of Ajayi and Faremi (2004) and Ogunsola-Bande(1995) that location and techniques of evaluation significantly influenced the learning outcomes of students in integrated science.

8. Conclusion and Recommendations

From the results of this study, it was concluded that there is significant difference between the performance of students in the closed book, open book and open time techniques of evaluating secondary school students in the learning of integrated science. The students' performance in the closed book technique was better than the performance in the open book while performance in the open book technique was significantly better than the performance in the open time technique. The performance of the students was influenced by the interaction of location(rural/urban) and techniques of evaluating secondary school students' learning in integrated science. While techniques of evaluating secondary school learning of

Integrated science acted independently to influence students' performance, rural and urban factor did not significantly influence learning of integrated science by the students. The application of open book techniques as a complementary technique to closed book technique of evaluating learning in Integrated science could engendered greater academic achievement on the part of the students in the classroom as it could reduce tension, anxiety, fear of failure and also instill into the students reading culture and increases the hope of passing examination without necessarily cheating.

It is therefore recommended that examiners should complement closed book technique of evaluating learning outcome with open book technique to reduce cheating behaviour, anxiety and fear of failing examination among the students. The open time technique should be used intermittently to keep the students busy at home towards making them to acquire mastery of the subject matter.

It is hoped that the implementation of these recommendations would lead to improvement in the reading culture of the secondary school students and subsequently great achievement in the learning of Integrated science and successful academic performance.

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Table 1: Summary of Analysis of Covariance of Test Scores by Evaluation Techniques and Location

Source of variation	SS	df	Ms	F
Main effect	138.368	3	46.123	107.713
Covariance (Cum. C.A. Scores)	310.071	1	310.070	734.122
Location	1.104	1	1.104	2.578
Techniques of Evaluation	135.941	2	67.970	158.734
Location Vs Techniques of Evaluation	9.808	2	4.904	11.453
Explained	458.247	6	76.374	178.361
Residual	61.233	293	.428	
Total	519.480	299		

$F \geq 0.05$

Table 2: Multiple Classification Analysis for Test Scores of Techniques of Evaluating Performance. Grand mean = 60.42

Variable and category	N	Unadjusted Deviation	Eta	Adjusted for Independent Covariance Deviation	Beta
Location					
Rural	150	- 0.18	10	- 0.08	0.05
Urban	150	0.21		0.9	
Techniques of Evaluation					
Closed book	300	1.91	39	2.89	0.046
Open book	300	-1.24		-0.91	
Open time	300	0.69		-2.00	
Multiple R Squared					0.208
Multiple R					0.456

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