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Systematic Assessment Procedure and Gender as Determinants of Students' Achievement in Integrated Science

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Abstract:
This study evaluated the effect of systematic assessment procedure and gender on student achievement in integrated science. The study adopted Quasi-experimental research design. 400 students chosen from nine Secondary Schools in Ekiti -West Local Government of Ekiti State constituted the sample for the study. Purposive sampling technique was used to select the schools and stratified simple random sampling technique was used to select the sample. Instrument used was Integrated Science Achievement Test (ISAT). Teachers Operational Guide (TOG) was used as operational guide for both experimental and control group. Reliability coefficient of 0.88 was obtained for ISAT. The data collected were analyzed using mean performance and student t-test at 0.05 level of significance. The study revealed that the students exposed to systematic assessment procedure achieved better than the students exposed to unsystematic assessment procedure. The result also revealed that there was significant difference in the academic performance of male and female students in integrated science achievement test. In view of the findings of this study, it was recommended that Systematic Assessment Procedure should be used in teaching Integrated Science in schools. More attention should be given to female students while teaching so as to meet up with their male counterparts.

Keywords: *Students' achievement, gender, systematic assessment procedure, academic performance*

1. Introduction

Developed countries of the world achieved their eminence by hard work and emphasis on Science and Technology. For instance, Japan, which is one of the leading countries in the production of electronics and automobiles, attached a lot of importance to the teaching of science subjects (Cambell, 2000). It is therefore necessary that in a developing country like Nigeria, more efforts should be made towards authentic development of Science and Technology by emphasizing science teaching and learning in schools so that Nigerians can manufacture and maintain the basic materials they needed and stop "undue importation of almost everything including tooth picks (Okpala, 1995).

It is expected that in Nigeria, where the training of scientists forms the basis for the much needed technological breakthrough, achievement in science at the secondary school level should be very encouraging. But the situation is such that science subjects are characterized by low enrolment and poor performance, particularly in Basic Science and Physics as shown by the National Examination Council (NECO) results of 2004-2008.

The reasons for such low enrolment and performance in science include, among other things: discouragement of students arising from poor performance of previous students at the Senior School Certificate Examination, Shortage of qualified teachers and effective science textbooks that suits the comprehension level of Junior Secondary school students (Anikweze, 2005).

Parents even assumed that the decline in science achievement of students in secondary schools might be traceable to deficiencies in teacher preparation (Okpala and Onocha ,1988). There is therefore the need for researches towards improving the quality of science teaching in Nigerian Secondary schools. These research efforts perhaps, will have the maximum impact on junior secondary school science (Integrated science). Thus, it is expected that any enhanced quality in integrated science teaching will motivate greater proportion of secondary school students to enroll in science subjects at the Senior Secondary level.

Ideally, a good integrated science teacher should adopt a teacher-pupil interaction pattern. This might encourage learners' active involvement in individual and group helpful activities such as asking questions, discussing, manipulating, explaining, demonstrating, prompt thinking, clarifying and so on, not in delivering monologues causing confusion and discouragement. Integrated science teachers also need to employ reliable and valid assessment procedure as an integral part of the teaching-learning process (Opkala and Onocha, 1994). In Nigeria, policy makers in education have as well acknowledged the need for effective integration of an assessment

procedure of high quality into the national formal school system. This could be seen from the emphasis given to Continuous Assessment (CA) in the Federal Republic of Nigeria (2014) as something that should infiltrate the country's educational system to ensure that the Nigeria child "really learns in school instead of mainly using the school as an examination-writing venue". Perhaps CA is one of the most popular features of the present day 6-3-3-4 educational structure in Nigeria. The policy document prescribes it as a substitute for the orthodox one-shot examination in schools. Various educational agencies in Nigeria have therefore embarked on series of work-shops and conferences on CA at all levels of government, and for a wide variety audience. Mathematics and science educators (Onocha and Okpala, 1995) also advocate for CA on the basis of its systematic characteristic among other attributes. They suggested that the planned and organized nature of procedures and techniques of CA implementation should perhaps augur well for effective teaching and learning of Mathematics and science subjects.

This study focused among other things, assessing the efficacy of a method of teaching integrated science that is characterized by systematic assessment procedures. It has been suggested by Onocha and Oyedeji, (1993) that the systematic attribute of CA is operationalized when its planning and organization involves students at the beginning of each school term during which practicing teachers inform the students on the:

i. topics on which assessment of the term's work should be based
ii. number of assessment scheduled for the term;
iii. topics to be covered by each assessment
iv. date for each assessment and type of instrument (e.g. essay test, multiple – choice tests and projects) to be used during each assessment. This suggestion of systematic assessment (Onocha and Okpala, 1995) is now being implemented in some states in Nigeria.

Integral to the concept of continuous assessment is explicit objectives-setting. Students will be better motivated if they have an idea on what they are going to learn and consequently what they are going to be assessed on (Obinna, 1997).

Besides, the effect of systematic assessment procedure, other learner's characteristics such as gender might also affect students' achievement in integrated science, especially in Nigeria where the traditional attitude of parents to the education of their children is to invest more in the education of boys (Onocha Okpala and Offorma, 1995). This differential investment, as well as other factors, has resulted in inequality in the opportunities for boys and girls which in later years might result in unequal access to education, health and employment (Adeniyi, 1996). Other science educators (Balogun, 1994; Williams 1996) have also documented the paucity of Nigeria girls and women in science and technology. It thus seems that gender stereotyping is still very much in Nigeria educational settings, and it may be a militating factor to science education of girls.

1.1. Research Questions

The following research questions were raised for the purpose of this study:

i. Is there any significant difference in the performance of students in the group exposed to assessment procedure and that of the group that was not exposed to assessment procedure?
ii. Will there be any effect of gender on students' achievement in integrated Science?

1.2. Research Hypotheses

Based on the stated problem, the following null hypotheses were postulated and tested in the course of the study:

H01: There is no significance difference in the performance of students in the group exposed to assessment procedure and that of the group that was not exposed to assessment procedure?

H02: There is no significant effect of gender on students' achievement in integrated science.

1.3. Research Design

The researcher employed quasi-experimental research approach. The study design was an experimental control group that employed pre-test, post-test treatment. The experimental and control groups were located at different schools consisting male and female students of equal ability.

1.4. Population

The population of the study consisted 2450 Junior Secondary School students in public Schools in Ekiti West Local Government Area of Ekiti State.

1.5. Sample and Sampling Techniques

A total number of 400 Junior Secondary School II students (200 males, 200 females) were selected in which purposive sampling technique was used to select schools that are considered eligible to participate in the study. To be eligible, the school must have:

- A full-time university graduate teacher of integrated science.
- Presented candidates for the Junior Secondary School integrated science examination for at least five years.
- Completed the JSS 1 integrated science curriculum at the time of data collection.
- Both male and female students.

Simple random sampling technique was used to select eight out of the eligible schools; random sampling technique was used to select two JSS 2 classes to participate in the study. All the students in the selected classes were part of the study sample.

1.6. Research Instrument

The instrument used in this the study was "Integrated Science Achievement Test (ISAT)": This is a test constructed by the researcher to determine the achievement of students in integrated science. It is a 25 items multiple-choice test with four alternatives.

The topics taught include:

1. Element, Mixture and Compound
2. Energy
3. Measurement
4. Simple Machine
5. Materials in the Community

1.6.1. Validity of the Instruments

The content and face validity were done by the experts in integrated science teachers for Integrated Science Achievement Test (ISAT) on the basis of adequacy.

1.6.2. Reliability of the Instruments

The method of test-retest was used to establish the reliability of Integrated Science Achievement Test (ISAT) as administered to 60 students outside the normal sample for the period of two weeks. The test showed no ambiguity in the instrument with the co-efficient correlation value of 0.88.

The lesson plans which serve as operational guide for the two groups were also trial tested by two integrated science teacher on J.S.S 11 students. The trial testing showed that the teachers had no problem in using the operational Guide for instruction (OGI) as examined by the experts, and produced inter-rater reliability value of 0.99.

2. Data Analysis

The multiple choice items were administered and scores were given to each item. Each item correctly answered was given a total score of one mark. The scores per group were collated and the hypotheses were tested using students' t- test analysis.

3. Results and Discussion

- H01: There is no significant different in the performance of the group exposed to assessment procedure and that of group II not exposed to assessment procedure.

Group	N	Mean	S D	Df	t-cal	t-tab
1	200	12.67	4.59	398	4.350	1.960
II	200	14.61	4.32			

Table 1: T-test analysis of students' performance of score in post-test.
**Significant P<0.05*

Table 2 reveals that t-calculated (4.350) is greater than t-table (1.960) at 0.05 level of significance. Hence, the null hypothesis was rejected. It was concluded that the experimental group (group II), which has the higher mean score performed significantly better than the control group (group I), which was not treated with systematic assessment procedure.

- Hypothesis 2: There is no significant effect of gender on students' achievement in integrated science.

Variables	N	Mean	SD	Df	t-cal	t-table
Female	100	11.19	4.66	198	4.81	1.960
Male	100	14.15	4.01			

Table 2: shows the t-test analysis of male and female academic performance in achievement test (post test).
**Significant P<0.05*

Table 2 shows that t-calculated (4.81) is greater than t-table (1.960) at 0.05 level of significance. Hence, the null hypothesis was rejected. Therefore, there is significance effect of gender on students' achievement in integrated science.

4. Discussion

Students exposed to systematic assessment procedure achieved more significantly better in integrated science than those students exposed to unsystematic assessment procedure. The assessment procedure had significant effect on students' achievement in integrated science. This is explicable considering the view of Ughamadu (1994) that the act of providing a student with advance information on the topics on which the assessment of an entire educational program should be based and the content areas to be covered by specific assessment is likely to motivate the students' learning and help to clarify instructional objectives; thus providing him with a better knowledge of learning outcome to be achieved. Generally, such a student is likely to tailor his study to the specific

content areas to be covered by each assessment. In addition, the student is more likely to engage in meaningful in-depth study of the content areas [Anikweze 2005]. In this respect, the results that student exposed to systematic assessment procedure tend to be achieve significantly better in integrated science than to those to unsystematic assessment procedure could be accounted for.

The effect of gender on students' achievement in integrated science was not significant. Thus, hypothesis was rejected. The mean score is used in order to determine which of the two gender groups of students achieved significantly higher than the other. As shown in Table 2, male students exhibit higher achievement in integrated science than the females. The result that gender had significant effect on students' achievement in integrated science seem to be in conflict with Iroegbu (1998) on gender-related differences in science achievement, However, the result corroborates the study findings of Uget and Habibah (2007), Finn el al. (2004) and Cambell (2000). The importance of schools and teachers calls for attention to school policy and classroom practice as key elements that define the learning environment that shapes gender differences in learning outcomes Qiang, (2000).

5. Recommendations

The recommendations border on the following aspects of integrated science teaching:

Secondary School Integrated Science Curriculum could be organized to provide opportunities for teachers to actually integrate systematic assessment procedure into their teaching. Perhaps, extra hands could be employed in order to reduce the average workload of integrated science teachers with the hope that any extra time created would be used by the teachers to meet up with the demands of effective integration of systematic assessment procedures into routine teaching of the subject.

Curriculum developers should reorganize the integrated science curriculum to make it more inviting for girls through introduction of more opportunities for out-of-school scientific activities and environmental education in science/ science and society. Government in conjunction with school administration and practicing integrated science teachers should be more patient with girls and if need be, should provide them with extra explanations on some relevant concepts.

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