

Formative Tests As A Predictor Of Students' Performance In Diagnostic Tests In Secondary School Biology.

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Abstract

Literature revealed that there was poor enrolment of students in Biology related courses such as medicine, pharmacy, radiography, nursing, medical laboratory science, dentistry as a result of poor performance of students in Biology. The purpose of the study was to find out the relationship between the students performance in formative and diagnostic test scores in senior secondary school Biology. The design of the study was correlation and the population was all the 1956 students in senior secondary school II students in biology in the 2008/2009 academic session. Simple random sampling (battling without replacement) was used to sample 650 students from 14 secondary schools in Ezeagu Local Government area of Enugu State. The method of data collection was documentary information from students' scores on formative and diagnostic tests. Pearson 'r' and t-test were used to correlate and test the research question and hypothesis at 0.05 level of confidence respectively. Based on the analyzed data, it was found out that out of the 10 schools studied, the relationship between formative and diagnostic scores was significant in seven schools, the relationship was significant in the co-educational and boys schools but that was not significant in the girls' schools

Keywords: Relationship, students' performance, formative and diagnostic, senior secondary and Biology examination.

Introduction

The process of finding out the students' performance and the extent to which the behavioural objective are achieved is called testing. Okoye (1997) noted that testing is a process of assessing the desired behavioural change in the learners. These processes take into account all the skills, attitudes, abilities, behavioural changes and knowledge, in subject acquired by the students in a particular programme. The reasons for testing could be to judge the level of achievement. Teachers need to know the successes of their students and in doing so, weakness in learning is revealed. To enable students realize their changes and how they improve by their efforts.

Okoye (1997) stated that if testing is to be effective, the teacher must ensure the success of his students' learning and to receive feedback from them in order to enable the teachers to be sensitive to their needs. Testing techniques include formative, diagnostic, theory (essay and objectives), practical, projects, questioning, marks and corrections. These different methods of assessment or evaluation are useful in the science in general and Biology in particular. It has been observed that the type of examination taking places in our schools strongly influence the type of study procedure used by students preparing for them.

Experience has shown that teachers do not use formative and diagnostic tests in the evaluation of students' performance in Biology. What makes a Biologist is not only how much information he/she has stored in his memory but the actual practice he receives in biological rigorous process, how he wonders, sets up a controlled experiment, his willingness to withhold judgments and how he realized the limitations of Biology. These are affected by not using formative and diagnostic tests in evaluating Biology in the secondary schools.

Okeke (1985) summarized some of the importance of using formative and diagnostic tests in the inculcation of scientific thought in the evaluation of Biology practical as;

the formative and diagnostic provide opportunity to promote the scientific method of thought. Diagnostic tests extend and re-reinforce theoretical learning. He also mentioned that practical promote problem solving and self-reliance in real life situation. Getting involved in formative and diagnostic tests can also enable students to learn much about the interrelationship between biology and other science subjects (p 38-39).

Tests are at times administered while instruction is going on so as to find out how far learning is progressing. These tests aimed at providing feed back to the teachers and students. When a test is used to monitor leaning progress, formative evaluation is said to have been made. For the students, the test provides information as regards the effectiveness of learning while the teacher uses it to know if his teaching has been effective. When

the teacher discovers, from the results of the test, that students have not learned as much as is expected, he may modify his instructional strategies. Usually scores obtained from formative tests are not supposed to be included in the final grading of the student (Okoye in Ezeudu, 1997).

When a student continues to experience learning difficulties despite all efforts to improve him, there arises a need to engage in a detailed diagnosis of his learning problem. This exercise is carried out with diagnostic tests. Using a medical analogy, Okoye in Ezeudu (1997) saw formative evaluation as providing first aid treatment for simple learning problems, while diagnostic evaluation is used to identify underlying causes of those problems that do not respond to first aid treatment. In developing a diagnostic test in a subject, several component abilities necessary for successful performance in the area must be covered. Thus a diagnostic test usually contains many sub-tests, each aimed at measuring a particular component parts. Items of the test should also be constructed in such a way that students are given the opportunity of committing errors that will indicate their deficiencies. Thus the primary concern of diagnostic evaluation is not to find out how much the student scores but his area of difficulty. Diagnostic tests are most relevant in subjects where acquisition or some skills or knowledge is a condition for the learning of higher concepts.

The evaluation techniques (formative and diagnostic) employed in the evaluation of Biology are designed ultimately to produce educated individuals. Some of whom may or may not take to biological studies in their professional pursuits. However, in whatever professional they finally find themselves, it is hoped that the Biology education they have acquired in school will be of value to the totality of their education. Correlation study is highly useful in studying problems in education or in other behavioural sciences. This permits one to measure a great number of variables and their interrelationships simultaneously. In behavioral science, we are frequently confronted with situation in which a large number of variables are contributory cause of a particular pattern of behaviour.

The classical experimental method which manipulates one variable and attempts to hold others constants often introduces a high level of artificiality into research situation encountered in the behavioural science. The partial correlation however, is often preferable to experimental design in situations where control is necessary as it permits the statistical control of variable that we wish to hold constant and does so without changing the field situation.

Having examined formative, diagnostic tests and rationale for the use of co relational study, it is pertinent to carry out a study on the relationship between students' performance in formative and diagnostic tests in senior secondary school Biology in Ezeagu LGA.

There is poor performance of students in biology as a result of inadequate use of the claimed method of evaluation biology such as formative and diagnostic tests. Okeke (1985) found out that the method of evaluating biology in particular and sciences in general affect students' performance. In recent years, there were increases in the poor performance of students in senior secondary certificate biology and this could be attributed to inadequate use of formative and diagnostic tests. Similarly Ebuoh, Nnaemeka and Nwosu (1989) found out that these students' poor performances were related to the use of the inadequate method of evaluating Biology in secondary schools. Consequently, the researcher wishes to investigate into the relationship of using formative test scores as a predictor of students' performance in diagnostic test scores and vice versa in senior secondary biology.

The purpose of the study was to find out the relationship between students performance in formative and diagnostic tests in senior secondary biology.

This study is restricted to senior secondary two biology students in Ezeagu local Government Area. It concerns itself with finding the relationship between students' performance in formative and diagnostic tests in mock Biology in the 2008/2009 academic session.

Research questions

What is the relationship between students' performance in formative and diagnostic test in senior secondary school Biology?

Hypothesis

There is no significant relationship between students' performance in formative and diagnostic tests in senior secondary school Biology.

The hypothesis was tested at five percent (5%) level of significance that is ninety five percent (95%) chances of being correct if rejected or failed to be accepted.

Methodology

This study was a correlation study. It was aimed at finding out the relationship between students' performance in formative and diagnostic tests in senior secondary school Biology.

The study was carried out in all the senior secondary schools in Ezeagu local government area of Enugu state. Ezeagu local -Government -Area- is one of the rural areas in Enugu state.

The population for the study comprised all the senior secondary school Biology students in 18 senior secondary schools in the Ezeagu L.G.A in 2008/2009 session. The students were made up of 1956 senior secondary school (SS2) Biology students.

The study did not use all the 1956 Biology students in the 18 senior secondary schools in the Local Government Area. Ten (about 50%) schools were randomly sampled. Simple balloting without replacement was used to sample four co-educational, three boys and three girls' schools and at least 60% of each type was composed of senior secondary school two students.

A proportionate random sampling based on about 40% was used to sample the representatives of the four co-educational, three boys' and three girls' schools. These were drawn by simple balloting without replacement and the sample size was 635 senior secondary school (SS2) Biology students.

The scores from the 635 senior secondary three (SS2) Biology students of the 10 sampled schools were extracted from biology scores. These data were collected by the researcher with the permission of the principals of the various schools.

In order to analyse the data, various tools were employed. Firstly, the Pearson's product moment correlation co-efficient was used to analyse the interval data and to find out the relationship between the two variables.

The calculated Pearson's 'r' was tested for significance with t-test statistics at five percent confidence level. The correlation coefficient were given qualitative interpretation based on the table 1 below

Table 1: Quantitative interpretation of correlation co-efficient

Correlation coefficient value	Interpretation
0.00-0.20	Very low/virtually no relationship
0.20-0.40	Low/ definite positive relationship
0.40 - 0.60	Medium relationship
0.60-0.80	High relationship
0.80-1.00	Very high/ near perfect relationship

Source: Nworgu (1992)

Results:

Research questions

What is the relationship between students' performance in formative and diagnostic test in senior secondary school Biology?

Results of the analysis of relationship and t-test obtained from various school types were presented in the table 2 below

Table 2: Overall of the Pearson's 'r' and t-test of students' performance in formative and diagnostic scores

Schools	Pearson's	Calculated -t	Table -t
Co-educational (Overall)	0.48*	4.25	2.06
Girls (Overall)	0.10	-24.80	2.02
Boys (Overall)	0.55*	11.29	2.10

* Significant correlation co-efficient

It is discernable from table 2 above that the overall relationship between formative and diagnostic scores in SSII biology examinations was positive in the various school types. There was very low/virtually no relationship in the three overall girls' schools. In schools where the relationship was positive, the magnitude was between 0.10 and 0.55 which showed a range of very low/virtually no relationship to medium relationship in the

two school types (co-educational and boys) the relationship was medium with correlation coefficient of 0.48 and 0.55 respectively.

Hypothesis

There is no significant relationship between students' performance in formative and diagnostic tests in senior secondary school Biology.

Out of the 10 schools studied, the relationship between formative and diagnostic scores was significant at five percent confidence level in seven schools. While in the three schools, the relationship was not significant. The relationship was significant in the co-educational, boys but not significant in the girls' schools

Discussions of the results

From the analysis of the results, it was observed that the students' performance in formative in relation to their scores in diagnostic was positive and significant in most of the schools types except in girls' schools (see table 2).

Out of the 10 schools studied, relationship was significant in 7 schools. The schools included Community secondary school, Olo, Model community secondary school, Olo, Boys secondary school Aguobu owa; Community secondary school, Ezema-owa; Boys secondary school, Amansiodo Oghe; Community secondary school Awha-Imezi and Community secondary school, Aguobu Iwollo.

The variation in the magnitude of the correlation coefficients among the various schools is comparable to Daniel (1984) in which essay scores were correlated with practical scores in mock-WASC with WASC O'Level results. The findings were quite significant for they have revealed some degrees of reliability and validity that existed especially in the practical and essay tests. The variation in relationship between essay and practical scores which ranged from very high/near perfect to very low/virtually no relationship could be attributed to certain factors.

The medium, high and very high near perfect relationship could be as a result of adequate staffing, both qualitatively and quantitatively in the different schools and in Biology. Qualitative staffing involves the handling of the subjects by teachers who were adequately informed in the course of measurement and evaluation and in the subject matter. Quantitative aspect implies appropriate teacher-student ratio. Similarly, Ali (1986) observed that the quality of staff affects students' performance in Biology subjects. The existence of qualitative and quantitative staff attributes lead to high quality instructions and evaluation. The very low/virtually no relationship and low/definite positive values of relationship might be that the schools lack qualitative and quantitative teachers in Biology. Thus the available teachers would be engulfed in heavy workloads which reduce adequate teaching and evaluation processes. Inappropriate teacher-student ratio results to excessive workload. It could as well be attributed to lack of regular seminar and workshops to acquaint the teachers-with necessary skills needed for construction, administration and scoring of formative and diagnostic tests; and the use of other evaluation techniques. These were highlighted in the work of Azikiwe (1989), Ebuoh, Nnaemeka and Nwosu (1989) and Okure (1989).

In the schools in which the relationship between formative and diagnostic scores was not significant could be attributed to lack of qualified teachers. This affects among other things the quality of constructions, evaluation instrument and the neglect of other evaluation techniques. This might be why Maduabum (1984) noted that for testing to be effective, the professional teachers must use various techniques to evaluate the success of his pupils' learning and receive feedback from them to enable him to be sensitive to their needs. Negative relationship might be militated by the factors highlighted above and in addition, inappropriate scoring. Th

Significant relationship was observed in four co-educational schools. The schools were CSS Olo, Model Secondary School Amandim Olo, CSS Aguobu Owa and CSS Imezi Owa. While there was no significant relationship in three Girls' schools namely Sedes Oghe, Girls secondary school, Mgbagbuowa and Girls Secondary School Imezi-Owa. The Boys schools have significant relationship. They included ABSS Oghe, High School, Iwollo and BSS Aguobu Owa. However, the relationship between students' formative and diagnostic scores varied from school to school and sex to sex. Udeigwe (1992) disagreed with this. He found out that none of the tests seems to discriminate in favour of any particular sex. The factors which accounted for variations in the magnitude of relationship as emphasized earlier were accountable for the variations in various school types.

Conclusion

1. The relationship in the students' performance in formative and diagnostic biology test were positive and moderate in all the school types except girl's secondary schools.

2. There was significant relationship between students' performance in formative and diagnostic biology test in all the schools except in girls' schools.

Conclusion

3. The relationship in the students' performance in formative and diagnostic biology test were positive and moderate in all the school types except girl's secondary schools.
4. There was significant relationship between students' performance in formative and diagnostic biology test in all the schools except in girls' schools.

Recommendations

- (1) In a situation where a student completes the two years of senior secondary school the formative could be used to make decision on students who might unavoidably be absent during the diagnostic test in Biology and vice versa
- (2) Alternatively, it could be used on such students that due to error of omission, their scripts lost in either formative or diagnostic tests in transit.

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