Measures of Equivalence as a Predictor of Students Reliability in Biology Objective Tests.

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Abstract: The purpose of the study was to investigate into the measures of equivalence as a predictor of student's reliability in biology objective test scores in secondary schools. The design of the study was correlation and the population was all the 1756 biology students of the senior secondary school two (SS 2) in the 2013/2014 academic session. Simple random sampling (battling without replacement) was used to sample 450 students from 14 secondary schools in Ezeagu Local Government area of Enugu Slate. The instrument for data collection was biology objective test (BOT). Pearson 'r' and t-test were used to correlate and test the hypothesis at 5% level of confidence. Based on the analyzed data, it was found out that out of the 10 schools studied, the measure of equivalence of objective test scores had significant reliability in seven schools. The reliability was significant in the co-educational and boys schools. In the girls' schools, the reliability was not significant

Keywords: Biology, Evaluation, Instrument, Performance, Predictor, Reliability, Students.

1. INTRODUCTION

The process of finding out how well students performance and the extent to which the behavioural objectives are achieved is called evaluation. [1] noted that evaluation is a process of assessing the effectiveness of a programme of study in order to bring about desired behavioural changes in the learner. 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 evaluation 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.

For evaluation to be effective, the teacher must be responsible for the success of his students' learning and to be ready to receive feedbacks from them in order to enable the teachers to be sensitive to the reliability of instrument (tests) for data collection. Evaluation techniques include theory (objectives and essay) practical, projects, questioning, marks and corrections. These different methods of assessment or evaluation are useful in the sciences in general and Biology in particular. It has been observed that the type of examination that takes place in our schools strongly influence the type of study procedure use by students preparing for them.

Reliability of an evaluation instrument refers to the yielding of the same results when the instrument is used on the same persons a number of times. It can also be defined as the property of a measuring instrument that makes possible the obtaining of similar results upon repetition. It is a measure of the degree to which such results may be predicted or the degree to which measurement is free from random influence.

In the classroom situation, reliability of a test refers to the consistency of individual student's scores in that test. That means that if two sets of scores are obtained with a test on a given group of students, individual student's scores in the two results would maintain fairly the same position in the group. Consider for example, a group of 5-students were given a 100 item test in Mathematics. This test was administered to the group again at an interval of one week and the results obtained were tabulated as follows:

The reliability coefficient of a test can be estimated using equivalent form method. In this method, standardized two different groups of individuals on the same day under the same conditions and the results correlated. The tests have equivalent forms when they contain similar but different items measuring the same objectives. With this procedure we are determining how confidently we can generalize a person's score to what he would score if he takes a test composed of similar but different question. Here instead of measuring changes from one time to another we measure changes due to specificity of knowledge. Examples of tests that have equivalent forms are JAMB aptitude tests and WASSCE examination questions.

Equivalent forms method of estimating reliability coefficient has these advantages:

1. It provides an opportunity to test one objective with more test items than would be the case in a single form test.
2. It estimates the problem of time-interval and influence of memory encountered in the test-retest method.

Experience has shown that the use of inadequate evaluation techniques in the determination of the students performance in Biology, particularly has ultimately denied the students the feeling of participation and reality. What makes a Biologist is how much information he/she has stored in his memory and 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 the use of objective tests in evaluating Biology.

The importance of objective tests in the evaluation of Biology cannot be over-emphasized, because the objective tests provide opportunity to promote the scientific method of thought. The scientific method of thought entails inculcating into the learners, the habit of drawing conclusions based on observation, experimentation and practical. Practical tests extend and re-reinforce theoretical learning. Practical promotes problem solving and self-reliance in real life situation. The use of objective tests can also enable students to learn much about the interrelationship between biology and other science subjects.

The evaluation techniques (objective tests) 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 profession 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 interrelationship simultaneously. In behavioral science, we are frequently confronted with situation in which a large number of variables are contributory causes of a particular pattern of behaviour. The classical experimental method which manipulates one variable and attempts to hold others constant 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.

This section of the work/the study delved and searched into previous but related work to the study. Consequent upon this, the literature review was approached from two perspectives namely:

1. Objective test types as acclaimed method of evaluating students' performance in Biology.
2. Factors militating against students' performance in essay and practical Biology examinations.

This sub-heading discusses the objective types as acclaimed method of evaluating students' performance in Biology. [2] noted that it is needless to re-emphasis the fact that Biology by its nature and characteristics is an intellectual subject. The less it is evaluated otherwise the more it ceases to be Biology that is examined. The objective tests are useful in evaluating and developing students' intellectual abilities in biology. Objective test types are more successful in evaluating lower order level of cognitive domain in Biology. Objective test types appear to offer means of development of students' performance in the learning of biological concepts, principles and methods. [3] noted that the objective test types are indispensable tools for the evaluation of the affective, psychomotor and cognitive domains of students' performances. Objective test

types yield more reliable (objective) result in the evaluation of Biology than essay tests. It was observed that objective test types are more suitable to low and average students when compared with essay test items. [4] stated that objective test type is the best because it creates fertile ground for the examination of the objective of the topic and because it sometimes discovering new terms. Therefore, the opportunity of making students the researchers or discovers full of curiosity, interest that were desired at formative stage of appreciation and seeing Biology as their best alternative to other subjects. Objective test types need to be dovetailed into essay type of assessment so that the entire content is a unique whole and evaluated in a manner conducive to thinking. Other methods of evaluating Biology (such as observation, questioning, projects, corrections and marks) lack the necessary intellectual development and creative thinking which are found in objective test types. [5] while comparing two evaluative methods in the evaluation of integrated science found out that objective method is more appropriate in evaluating integrated science (Biology chemistry and physics). Evaluation should be made more objective oriented so that examinees can be more actively involved and makes for recall of facts. [5] stated that Biology cannot be evaluated from but through objective and written expressions. [6] found out that practical and objective types are the best methods of evaluating Biology and indeed other sciences. The test format allow students not to guess, put down, experience, observe, experiment and draw conclusions so that they can perceive Biology at it. [7] claimed the superiority of objective and practical from the advantages they have over other evaluative techniques.

This type of test is characterized by only one correct answer to a question. It consists, usually of a large number of test items each with a set of possible answers and corrects answer. They are called objectives tests because, they are purely/truly objectives with standard scores devoid of subjectivity of assessment or such extraneous factors as the respondents' handwriting, grammar and dictation or the psychological needs and prejudices of the examiner.

The objective tests have the following advantages and disadvantages according to [7].

1. They eliminate scorer's inconsistencies/unreliability. Objectives test can much more readily be made reliable in their scoring. The tests do not suffer from such problems as the human error of the scorer, such as 'halo effects', writing, and vagueness of scoring key.
2. Marking is relatively easy and less time-consuming.
3. They can be marked by non-experts or even by machine.
4. They can much more adequately sample the universe of subject-matter content and of types of behaviour consisting the goals of particular unit of the curriculum, that is the whole field of knowledge is sample.
5. In an objective test, all the students' strong and weak points are probed.

The disadvantages are

1. The construction of the objective tests is time consuming.
2. They are difficult and require great skill in setting/constructing them.
3. The cost of printing/duplicating the test is considerably greater.

Knowledge gained, through objective tests are easily retained and recalled. They provide students the opportunity to acquire various skills such weighing, measuring, recording and predicting student's performance. They also make the phenomena being evaluated more real through thinking and actual experience. Having examined the rationale for the use of co relational study, objective tests, it is pertinent to carry out a study on the measure of equivalence as a predictor of student's reliability in biology objective tests in secondary school Biology.

There is low reliability of evaluation instrument use in evaluating biology as a result of inadequate use of the claimed method of evaluation biology. [3] found out that the method of evaluating biology in particular and sciences in general affect reliability of evaluation instrument. In recent years, there were increases in the poor performance of students in senior secondary certificate biology. Similarly [8] found out that this low reliability was related to the use of the inadequate method of evaluating Biology in secondary schools. The researcher therefore, wishes to investigate into the measure of equivalence as a predictor of student's reliability in biology objective tests in secondary schools.

The purpose of the study was to find out the relationship between measure of equivalence as a predictor of student's reliability in biology objective tests.

This study is restricted to senior secondary two (SS 11) biology students in Ezeagu local Government Area of Enugu State. It concerns itself in finding the relationship between measures of equivalence as a predictor of student's reliability in biology objective tests.

1.1 Research question

What is the relationship between measures of equivalence as a predictor of student's reliability in biology objective tests?

1.2 Hypothesis

There is no significant relationship between measures of equivalence on student's reliability in biology objective tests.

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.

2. METHO1DOLOGY

This study is a co relational study. It was aimed at finding out the relationship between measures of equivalence on student's reliability in biology objective tests.

The population for the study comprised all the 1756 senior secondary two (SS 2) Biology students in the 10 secondary schools in the Ezeagu Local Government Area in 2013/2014 session. The study did not use all the 1756 Biology students in the 17 secondary schools in the Local Government Area, 10 schools were randomly sampled. The schools were stratified using type variable to ensure appropriate representation. Simple balloting without replacement was used to sample 4 co-educational, 3 boys' and 3 girls' schools.

A proportionate random sampling based on about 40% was used to sample the representatives of the four co-educational, three boys and three girl's schools. These were drawn by .simple balloting without replacement and the sample size was 450 senior secondary school (SS3) Biology students that wrote the biology objective tests (BOT).

In method of data collection, the scores from the 450 senior secondary two (SS 2) Biology students of the 10 sampled schools were extracted from their scripts after the administration and scoring of BOT.

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 the relationship between the two administrations of the tests.

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

Table 1: Quantitative interpretation of co -relation co-efficient.

Correlation coefficient value	Interpretation
O.OOv-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: [1]

3. Results

Research question: What is the relationship between measures of equivalence as a predictor of student's reliability in biology objective tests?

The result of the research question is presented in table 2 below.
It was shown from table 2 below that the relationship between measures of equivalence on student's reliability in biology objective tests was positive in the various school types. There was very low/virtually no relationship between measures of equivalence on student's reliability in biology objective tests in the two 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 ad boys) the relationship was medium with correlation coefficient of 0.48 and 0.55 respectively.

3.1 Hypothesis

There is no significant relationship between measures of equivalence on student's reliability in biology objective tests.

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

Table 2: Pearson's 'r' and t-test of the relationship between measures of equivalence on student's reliability in biology objective tests 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

The results of the hypothesis are presented in table 2 above.

Out of the 10 schools studied, the relationship between the two groups was significant at 5% confidence level in 7 schools. While in the 3 schools, the relationship was not significant. The relationship was significant in the co-educational, boys but not significant in the girls' schools (see table 2).

Discussion of results

From the analysis of the results, it was observed that the students' reliability in objective tests in relation to the groups (coeducational and boy's schools) was positive and significant in most of the schools types except in girls' schools (see table 2).

The variation in the magnitude of the correlation coefficients among the various schools is comparable to [9] in which essay scores were correlated with objective test scores in mock-WASC with WASC O'Level results. The finding was quite significant for they have shown some degrees of reliability and validity that existed especially in the objective and essay tests. The variation in relationship between objective and essay test 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, [10] 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/virtually 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 tests; and the use of other evaluation techniques. These were highlighted in the work of [11] and [12]

In schools in which the reliability 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 such as objective tests. This might be why [7] noted that for evaluation to be effective, the professional evaluators/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. Inappropriate scoring manifests in either generosity or severity in scoring which results in invalidity of scoring. Lack of standardization of evaluation instruments could cause variation in relationship in various school types' especially very low and negative relationship. Supporting the view, [6] corroborated that non standardization is likely to cause difference in students' performance in essay and practical in Senior Secondary mock Biology.

Significant relationship was observed in four co-educational schools. The schools were Community Secondary School (C S S) Olo, Model Secondary School Amandim Olo, CSS Aguobu Own 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 Boy's schools had significant relationship. They included ABSS, Oghe; Community High School, Iwollo and BSS Aguobu Owa. However, the relationship between students' scores varied from school to school and sex to sex. [13] 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

4 CONCLUSIONS

1 The relationship in the students' reliability in biology objective tests was positive and moderate in all the school types except girl's secondary schools.
2 There was significant relationship between students' reliability in biology objective test in biology in all the schools except in girls' schools.

5. RECOMMENDATIONS

1 Topics on reliability (measures of equivalence) should be included in the course content of teachers in the tertiary institutions.
2 In a case where the students' performance in the first and second tests are reliability there could be used to substitute the students performance where the students answer scripts were not found/ omitted.

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