



Relationship between Students' Achievement in Essay and Practical Tests on Biology in Nsukka Education Zone

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Authors' contributions

This work was carried out in collaboration between both authors. Author IIA designed the study, performed the statistical analysis and wrote the protocol. Author EHO wrote the first draft of the manuscript, managed the analyses of the study and the literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

This study investigated the relationship between students' achievement in practical and essay tests on biology. Two research questions were formulated- (i) what is the difference in the mean score of students in practical and essay tests in mock biology examinations? (ii) what is the measure of relationship (correlation coefficient) of students' achievement in practical and essay aspects of biology tests? The research was conducted among public secondary schools in Nsukka Education Zone of Enugu State with a sampled population of 560 biology students (321 males and 239 females) from randomly sampled schools from the three local government areas in the zone. The Correlation survey research design was adopted for this study and the instrument of data collection were the results of the 2018 students' mock practical and theoretical tests on biology from the sampled schools. The data collected were analysed using Descriptive statistics (mean and standard deviation) for research question 1, while the Pearson Product-Moment Correlation Coefficient analysis was used for research question 2. The findings of the study revealed that a weak positive

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association existed between the students' achievement in practical and essay biology tests. So, the achievement in one aspect does not in any way influence the achievement in the other. The study thus recommends that: (1) teachers should have good mastery and evaluation techniques of all components of biology so that students would approach them with equal ability; (2) parents should encourage the students to develop interest and ability in the different components of biology; and (3) government should provide and equip biology laboratories to ensure students' utilization of same.

Keywords: Achievement; practical biology; mock; essay; relationship.

1. INTRODUCTION

Summative evaluations are generally administered to test the level of students' understanding of subjects/courses that have been taught to them over a given period, usually at the end of a term, semester or academic programme at an educational level [1]. In most subject areas, the examinations are theoretical; either in the form of multiple choice questions or essay questions. In a few subjects, such as Physics, Chemistry, Biology and so on, where the course of study has a substantial practical component, students are examined in both theoretical and practical components to test their understanding of each of the components studied. Practical examination of science students is mostly conducted in laboratory. During such practical/laboratory examinations, students are provided with specimens or work guide (manual) and some sort of equipment which could be used to investigate scientific problems to understand theories and principles of science subjects [2].

The Senior School Certificate Examination organised by the West African Examination Council (WAEC) is one of the required summative examinations in West Africa. The Biology part of the examination consists of three papers: Papers 1, 2 and 3, all of which must be taken by all candidates. Papers 1 and 2 are a composite paper to be taken at one sitting. Each of the papers is allocated with marks. Paper 1, which is objective is allotted 50 marks, paper 2, which is the essay carries 20 marks; while paper 3, which is the practical aspect of the examination carries 30 marks. From the foregoing, it is evident that every biology student at the Senior Secondary School Examination (SSCE) takes three different examinations: objective; essay and practical.

Even though the practical aspect of the Senior Secondary School Certificate examination on biology is allocated 30 marks out of 100 marks,

the teaching of practical biology in most Nigerian schools is bedeviled with the following problems: (i) Use of obsolete equipment in teaching practical biology. (ii) Lack of practical biology laboratories/ state of the art equipment. (iii) Lack of emphases in teaching practical biology by some teachers. (iv) Difficulty in having access to specimens [3]. In view of these problems, the students' overall achievement in practical biology is adversely affected [3]. In turn, the expectation or insinuation is that the achievement of these students in practical component of biology may make or mar their achievement in the essay aspect of the subject and vice versa. This is because the science curricula are drawn in such a way that topics taught theoretically are also incorporated into the practical aspect. So, while the essay test evaluates this theoretical knowledge, the practical aspect evaluates the ability of the students to transfer the theoretical knowledge into practice. As such, a poor foundation in theory, demonstrated by poor performances in the essay test should also mean a poor performance in the practical test. That is of course if the equipment and competent teachers are available.

In view of the countervailing assumptions, the problem of this study therefore, is to investigate the nature of relationship (whether linear, inverse or partial) that exist between students' achievement in practical and essay type tests in mock biology examination of Senior Secondary class three (SS III) students.

1.1 Research Questions

1. What is the difference in the mean score of students in practical and essay tests in mock biology examinations?
2. What is the measure of relationship (correlation coefficient) of practical and essay aspects of mock biology examinations?

1.2 Hypotheses

H₀₁: There is no significant relationship between the achievement of students in the mean score of students in practical and the essay tests of mock biology examinations.

H₀₂: There no significant relationship between the achievement of students in practical and essay tests of mock biology examinations.

2. RESEARCH METHODS

Correlational survey research design was adopted for this study. This is apt because the researcher would involve both the Mock examination results on both biology practical and theory of the sampled population of this study to determine their achievement in both aspects of biology. Due to the near inaccessibility of WAEC and other public examination scores by researchers, this study made use of mock scores in practical and essay biology. The mock score is much more accessible and is of the same standard and coverage of curriculum set by the state examination board.

The area covered by the study is Nsukka Education Zone of Enugu State, which consists of three local government areas with these number of public secondary schools that took SSCE in 2019; Igbo Etiti, 16; Uzo-Uwani, 14; and Nsukka local government area, 31. This area is chosen because it is the zone with the highest number of public secondary schools in Enugu State (Statistic Unit, PPSMB, Nsukka zone, Enugu state, 2019). The result of this study could therefore be used to infer what is obtainable across the State and beyond.

The population of the study comprises all the 2477 students that sat for Biology in the 2018 Senior Secondary Certificate Examination in the 61 public secondary schools in Nsukka Education Zone, Enugu State (Statistics Unit, PPSMB, Nsukka Zone). The sample size for this study was 560 students. Stratified random sampling technique was adopted in selecting the students. This was done by randomly selecting three schools from the already stratified three local government areas that make up the Nsukka Education zone. The schools randomly selected and the students that sat for Biology in the 2018 SSCE in Nsukka Local Government

Area were: St. Theresa College, Nsukka (105), Community Secondary School, Isieniu (60), Queen of the Rosary College, Nsukka (110); in Uzo-Uwani LGA, the schools were Uzo-Uwani Secondary School Adani (41), Community Secondary School Abi-Ugbene (71), and Community High School Nrobo (14); while in Igbo-Etiti LGA, the school were Premier Secondary School Ukehe (76), Community Secondary school Ohodo (14) and Community Secondary School Aku (69).

The instruments for data collection were the results of the 2018 Students' Mock Practical Test on Biology (SMPTB) and the Students' Theoretical Knowledge of Biology (STKB), which were retrieved from the examination records offices of the sampled schools. The instruments, having been prepared by the Enugu State Post Primary School Management Board must have been drawn from the WASC syllabus and must have been tested and found to reliable to assess students of Senior Secondary class three (SS III). Similar to the validation of the instrument, the researcher did not further subject them to reliability tests.

Research question 1 was answered using Descriptive statistics (mean and standard deviation) the t-test. For research question 2, Pearson Product-Moment Correlation Coefficient analysis was used to find the relationship between their theoretical and practical examination scores. Correlation is a statistical method that is simple to calculate and interpret, which is used to determine a possible linear association between two continuous variables [4]. A positive relationship signifies that the two variables increase at the same time while a negative relationship signifies that when one increases the other decreases.

The Null hypothesis was tested using t-test statistics at 0.05 significant level. The decision rule here is that if the probability value, that is, the significant value is less than the alpha value of 0.05 it shows that the null hypotheses is rejected. Conversely, if the significant value is greater than the alpha value of 0.05, it shows that we fail to reject the null hypotheses.

3. RESULTS

The Table 1 shows that the significant value of 0.000 was obtained. This is less than the 0.05 level of significance. This means that there is a significant difference in the mean

Table 1. T-test analysis of data on mean rating of students' performance in practical and essay biology

| | Mean | SD | t-v | df | Sig. value | Remarks |
|------|-------|-------|---------|-----|------------|-------------|
| SPTB | 23.14 | 4.808 | -56.470 | 559 | 0.000 | Significant |
| STKB | 41.49 | 7.198 | | | | |

Level of Significance = 0.05

Table 2. Measure of relationship (correlation coefficient) of practical and essay aspects of Mock biology test

| | | Student's Mock Practical Test on Biology (SMPTB) | Student's Theoretical Knowledge of Biology (STKB) |
|--|---------------------|--|---|
| Student's Mock Practical Test on Biology (SMPTB) | Pearson Correlation | 1 | .228** |
| | Sig. (2-tailed) | | .000 |
| | N | 560 | 560 |
| Student's Theoretical Knowledge of Biology (STKB) | Pearson Correlation | .228** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 560 | 560 |

** Correlation is significant at the 0.01 level (2- tailed)

performance scores of the students in STKB (M= 41.49, SD= 7.198) and SMPTB (M=23.14, SD =4.808), with (t (559) = -56.47; P<0.001). Therefore, the hypothesis that there is no significant difference between the performance of students in practical and essay aspects of SSCE biology is rejected.

A Pearson product- moment Correlation Coefficient was conducted to measure the relationship of students' achievement in practical and essay aspects of biology (N=560). Preliminary analysis shows that there were no violations in the assumptions of normality, linearity or homoscedasticity. $r(0.228)**$ $r(560) = 0.228$, $p < 0.01$ achievement levels of STKB. This shows that there was a weak positive association between the students' mock practical Test on Biology and their theoretical knowledge of biology.

4. DISCUSSION

The results from this study assert that there is little to no relationship in the students' scores in both essay and practical tests. This means that the knowledge of one aspect has no impact on the other. Other related studies also revealed such low correlations between students' achievement in both aspects [5,6,7]. This gap in scores could be due to the incompetency of teachers in teaching and evaluating their

students in either of the aspects. It could also be due to lack of practical equipment, such as laboratory specimen and apparatus, which are necessary for teaching and practice before assessment tests. In schools lacking these equipment, students might only have access to the practical instrument during assessment tests. Moreover, the practical and essay tests are not written on the same day. The practical test is usually written weeks before the essay part. The difference in test days might influence the level of preparedness among the students. It also makes the students read for these exams as separate subjects and not parts of a whole. The influence of the difference in test days on scores is observed in other studies that conducted both practical and essay tests within the same period [8,9,10]. A strong correlation was observed in these studies and the researchers were able to predict the students' scores in the practical test with that from the essay test.

5. CONCLUSION

From the findings of this study, it is obvious that there exists a significant difference in the students' achievement in their Biology essay and practical tests. And this could be due to teacher incompetency, unavailability of required teaching tools or the separation of test days.

6. RECOMMENDATIONS

In view of the findings of this study, the following recommendations are made:

1. Teachers are encouraged to have good mastery and evaluation technique of all components of biology so that students would approach them with equal ability.
2. The government and other relevant authorities should ensure that the necessary teaching tools and practical apparatus are always available for routine teaching and practice.
3. There should be a readjustment in the test timetable, so that students would write both tests on the same day and be able to face both aspects with equal preparedness.

CONSENT

As per international standard or university standard, students' written consent has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Dixon DD, Worrell FC. Formative and summative assessment in the classroom. *Theory not Practice*. 2016;55(2):153-159.
2. Adane L, Admas A. Relevance and safety of chemistry laboratory experiments from students' perspective: A case study at Jimma University, Southwestern Ethiopia. *Educational Research*. 2011;2(12):1749-1758.
3. Owino OA, Ahmad O, Yungungu A. 'An investment of factors that influence performance in KCSEbiology in selected secondary schools in Nyakach District, Kisumu Country. Kenya' *Journal of Educationand Human Development*. 2014; 3(2):957-977.
4. Mukaka MM. Statistics corner: A guide to appropriate use of correlation coefficient in medical research. *The Journal of Medical Association of Malawi*. 2012;24(3):69–71.
5. Mohammad GS. The relationship between students' achievement in the theoretical and practical aspects of senior school certificate mock examination in chemistry. University of Nigeria Nsukka (unn). Unpublished Ph.d dissertation; 2011.
6. Nawaz N, Mahmood N, Akram Rana R. Relationshipbetween post-graduate science students in theory and practical examination: Adimension to assess quality of higher education. *Bulletin of Education & Research*. 2013;26(1):41–47.
7. Jaishree C, Saeed D, Usha R. Pre-clinical test scores as a predictor of students' performance: A retrospective study in final year BDS. *JETHS*. 2014;1(2):39–42.
8. Omole DO, Ajayi SO. A correlational study of students' scores in basic science theory and practical subjects in Kwara State College of Education. *Ilorin Journal of Education*. 1999;19:75-80.
9. Uwaifo VO. A Comparative study of the achievement of students in technology education theory and practical subjects in Nigerian universities. *Studies on Home and Community Science*. 2012;4:87-89.
10. Galadanci BS, Mukhtar MI. A Correlational Study of Students' Theoretical and Practical Examination Scores in Computer Applications Courses in Bayero University, Kano. *Science World Journal*. 2017;12(2): 12-15.

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