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Comparative Analysis of Upper Basic II Students' Academic Performance in Basic Technology in Ikwuano L.G.A.,

Abia State, Nigeria

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Abstract

This study compared Upper Basic II students' performance on essay and multiple-choice test instruments in Ikwuano Local Government Area of Abia State. Three research questions and two hypotheses guided the study. The quasi experimental design was adopted for the study. The population of the study was 1380 students of Basic II students in the 19 public secondary schools in Ikwuano L.G.A, Abia State. Simple random sampling technique was used to select four secondary schools and 160 students constituted the sample for the study from Ikwuano L.G.A. The instruments for data collection were Basic Technology Performance Test (BSPT), and Basic Technology Essay Test (BTET). The reliability of the instrument was established using split half method trial tested on 40 upper Basic II students in Government Secondary School Owerri, Imo State. The internal consistency of the two instruments was calculated using Spearman Brown's statistical method which yielded a reliability coefficient of 0.89 for the multiple-choice test and 0.83 for the essay test. The mean was used to answer the research questions, while the Analysis of Covariance (ANCOVA) was used to test the hypotheses at $P\leq$ 0. 05 level of significance. The study revealed that students who were tested with multiple choice test performed better than students who were tested with essay with a small margin. Female students performed better than male students who were tested with multiple choice test and essay test, and Gender had no significant influence on the mean achievement scores of Basic Technology students in multiple choice test and essay test.

Keywords: Comparison, Upper Basic School, Performance, Basic Technology

Introduction

The relevance of secondary school education cannot be over emphasized as it is the bed rock of national development. Upper Basic school is an intermediary school for students after elementary /lower basic school, but not yet in senior secondary school. At this level most of all subjects are made compulsory to enable the children widen their scope and knowledge in preparation for senior secondary school. Upper basic school is for children from ages 10-12 which is pre-vocational and academic in scope.

Basic Technology is one of the pre-vocational subjects that are offered at the Upper Basic School (JSS) level (Federal Republic of Nigeria, FRN, 2013). The National Policy on Education (FRN, 2013; Odu, 2013) stated that the Upper Basic schools are both prevocational and academic. However, the policy document goes further to state the pre-vocational subjects such as: woodwork, metal work, basic electronics, applied electricity, elementary building construction, technical drawing, food preservation and storage and others. With the intense benefit technology offers to mankind, it is therefore imperative for adequate and appropriate implementation of the Basic Technology teaching/learning. Babatunde (2015) asserted that technology includes all tools, machines, utensils, weapons, instruments, housing, clothing, communicating and transporting devices and the skills and its applications. Koay (2013) opined that technology refers to all tools and procedures used or required for manufacturing and producing materials needed for daily life. Basic Technology according to Otamba, 2013, is a subject taught in the Upper Basic schools with the incorporation of many skilled subjects such as woodwork, metal work, electrical/electronics, mechanics, technical drawing and local crafts to enable students of that school age be abreast with basic technological skills and competencies for useful living to enable the individual contribute to the development of the nation. Basic technology therefore is the introductory technological subject like block laying, bricklaying and concreting, applied electricity, basic electronics, metal work, woodwork, technical drawing taught at the upper basic school to enable students develop skill and competence that will help them in their chosen carrier so as to be relevant to themselves and contribute their own quota to the development of the Nation. The objectives of Basic technology are: to provide pre-vocational orientation for further training in technology, to provide basic technological literacy for everyday living to stimulate creativity and innovation.

The basic need for teaching vocational subjects in Upper Basic School is to enable the individual acquire appropriate skills, abilities and competence as equipment for him to live in,

and contribute to the development of the society (Olaitan, 2006). Implicitly, one of the broad aims of secondary education, among others is to equip the students to live effectively in our modern age of science and technology (FRN, 2013). Despite the relevance of basic technology, the cry for poor implementation of the curriculum for basic technology still poses a challenge to secondary education in Ikwuano, Abia State. Odu (2013) lamented that recurring problem besieging technical education since its inception has been the development and preparation of suitable tests to test students' level of understanding by teachers of Basic Technology. This lament by Odu prompted Ibe (2018) to suggest the adoption of properly developed multiple choice tests by teachers of Basic Technology.

Multiple choice or objective test is a form of an objective assessment in which respondents are asked to select only correct answers from the options offered as a list. The multiple-choice question test is perhaps the most popular educational evaluation method used at all levels. The challenge of using this method is designing well-written questions that are reliable and can discriminate the more knowledgeable students from the less knowledgeable students. Every question can be evaluated qualitatively (well written) and quantitatively (reliable and able to discriminate). While the multiple choice tests are commonly and widely used in schools, there are other types of test which are also used in assessment of students' performance such as the matching tests, oral exams, short answer test, computational questions, and essay tests.

The essay tests are commonly used like the multiple choice tests. The essay test according to Louis (2012) is a test that requires the student to structure a rather long written response up to several paragraphs. Essay test gives full freedom to the students to write any convincing number of pages. The required response vary in length. An essay type question requires the student to plan his own answer and to explain it in his own words. The student exercises considerable freedom to select, organise and present their ideas (Usman, 2010). According to Odu (2013) the type of test used in assessing students has substantial impact on their academic performance.

Academic performance is a measure of the extent to which a student has achieved their educational goals (Onuoha, 2021). It is commonly measured through examinations and continuous assessments. The performance of Basic Technology students in the Basic Education Certificate Examination (BECE) calls for proper investigation of causes of poor academic performance of Upper Basic schools students in Ikwuano Local Government Area of Abia State. Although, several researchers have proposed various factors responsible for the poor academic performance of students, few researches have been dedicated to the correlation

between multiple choice and essay types of testing. Hence the issue has thus remained unresolved, implying that more research is needed. Therefore this study is comparative analysis of upper Basic II students' academic performance on selected Basic technology topics using Essay and Multiple choice test instruments in Ikwuano Local Government Area, Abia State.

Statement of the Problem

The performance of Basic Technology students has not been as it should. This is evident in the poor academic performance of Basic Technology students in the Basic Education Certificate Examination (BECE) of 2021, 2020, and 2019 examination report in which the chief examiner commented that the performance of students in Basic technology was not encouraging. The performance of Basic Technology students in the Basic Education Certificate Examination (BECE) calls for proper investigation of causes of poor academic performance of Upper Basic schools students in Ikwuano Local Government Area of Abia State. Although, several scholars have proposed various factors responsible for the poor performance of students, few researches have been dedicated to the correlation between multiple choice testing and academic performance of students. Hence the issue has thus remained unresolved, implying that more research is needed. Therefore, the burden of this study was to comparatively analyze upper Basic II students' academic performance on selected Basic Technology topics using essay and multiple choice test instruments in Ikwuano Local Government Area of Abia State.

Purpose of the Study

The purpose of this study is to comparatively analyze the academic performance of upper Basic II students on selected Basic Technology topics using essay and multiple choice test instruments in Ikwuano Local Government Area of Abia State. Specifically, the study compared:

1. The mean scores of Basic Technology students in multiple choice test and essay test.
2. The mean scores of female and male students in multiple choice test.
3. The mean scores of female and male students in essay test.

Research Questions

1. What are the mean scores of Basic Technology students in multiple choice test and essay test?
2. What are the mean scores of female and male students on multiple choice test?
3. What are the mean scores of female and male students on essay test?

Hypothesis

HO_1: There is no significant difference in the mean scores of female and male students on multiple choice test.

HO_2: There is no significant difference in the mean scores of female and male students on essay test.

Methodology

The study was carried out in Ikwuano Local Government Area of Abia State, Nigeria. The posttest only quasi experimental design was adopted for the study. The design was used for the study because the study was carried out in a classroom situation, and in a classroom situation it is impossible to carry out a purely experimental study. This design is also suitable because students were used in their intact classes so as to provide stability and avoid disruption of class lessons and class arrangement. The population of the study was 1340 students of Upper Basic II schools in the 19 public secondary schools in Ikwuano L.G.A, Abia State (SEMB, 2023). Simple random sampling was employed in selecting four Upper Basic II schools from Ikwuano L.G.A, Abia State. In all, 158 students constituted the sample for the study. Subjects were therefore classified into the experimental and control groups. Since intact classes were used, no sampling was done to select the students. Therefore, all the students of the four Upper Basic II schools were used for the study.

The instruments for data collection were Basic Technology Achievement Test (BTAT), and Basic Technology Essay Test (BTET). The BTAT is a multiple choice test of 30 item questions generated based on a test blue print which shows the weight of each topic and number of items generated from each topic. The basic consideration in developing the test blue print was the

objectives to be achieved by each topic as stipulated in the curriculum and the time required in teaching each topic. The essay test was a six question also generated with reference to the same test blue print. Both tests were generated from the first term Upper Basic II Basic Technology unified scheme used by schools in Ikwuano L.G.A during the 2022/2023 session. The instruments were validated by three experts. These experts were requested to review and modify the items, and to remove or add items they considered inappropriate or appropriate. The comments, suggestions and corrections made by validates were used in making the final draft of the instrument.

The instruments were trial tested on 40 Upper Basic II students in Government Secondary School Owerri, Imo State. The Internal consistencies of the two instruments were calculated using Spearman Brown's statistical method of establishing reliability which yielded a reliability coefficient of 0.89 for the Multi-choice test and 0.83 for the essay test.

The researcher with the help of two research assistants performed the process on the students for six weeks. Next, the researcher then administered the treatments (multi-choice test) to the experimental group and the essay test to the control group. The researcher then marked and scored the two tests. The scores of the multi-choice test, and essay test were then analyzed and then used to answer the research questions and hypotheses. The mean was used to answer the research questions, while the Analysis of Covariance (ANCOVA) was used to test the hypotheses at $P \leq 0.05$ level of significance. For decision, when the P value was less than 0.05 the null hypothesis was rejected, and when the P value was higher than 0.05, the null hypothesis was accepted.

RESULTS

Research Question 1

What are the mean scores of Basic technology students in multiple choice test and Essay test?

Table 1: Mean Scores of Basic Technology Students in Multiple Choice and Essay Test

Study Groups	N	Mean	Mean difference
Experimental (Multiple) Choice Test	74	19.76	0.83
Control (Essay Test)	84	18.93	

Table 1 shows the mean scores of Basic technology students **i**n multiple choice test and essay test. The result reveals that the mean score (19.76) of students who were tested with multiple choice test was higher than the mean score (18.93) of the students who were tested with restricted essay with a difference of 0.83. This implies that students who were tested with multiple choice test performed better than students who were tested with essay with a small margin.

Research Question 2

What are the mean scores of male students and female students on multiple choice test?

Table 2: Mean Scores of Male and Female Basic Technology Students in Multiple Choice Test

Gender	N	Mean	Mean difference
Female	44	21.36	
Male	30	17.40	3.96

Table 2 shows the mean scores of male and female Basic technology students **i**n multiple choice test. The result reveals that the mean score of the female students (21.36) who were tested with multiple choice test was higher than the mean score of the male students (17.40) who were tested with the same test with a difference of 3.96. This implies that female students who were tested with multiple choice test performed better than male students who were tested with multiple choice test.

Research Question 3

What are the mean scores of male students and female students on Essay test?

Table 3: Mean Scores of Male and Female Basic Technology Students in Essay Test

Gender	N	Mean	Mean difference
Female	44	19.10	
Male	40	18.76	0.34

Table 3 shows the mean scores of male and female Basic technology students **i**n Essay test. The result in table 3 reveals that the mean score of the female students (19.10) who were tested with Essay test was higher than the mean score of the male students (18.76) who were tested with the same test with a difference of 0.34. This implies that female students who were tested with Essay test performed better than male students who were tested with Essay test.

Hypothesis 1:

There is no significant difference in the mean score of male students and the mean score of female students in multiple choice tests.

Table 4: Analysis of Covariance of the Mean Scores of Male and Female Basic Technology Students in Multiple Choice Test

Source of Variation	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	454.119[a]	2	227.059	7.777	.002	.314
Intercept	122.556	1	122.556	4.198	.048	.110
Essay (Covariate)	313.999	1	313.999	10.755	.002	.240
Gender (Main Effect)	49.109	1	49.109	1.682	.203	.047
Error	992.692	72	29.197			
Total	15889.000	75				
Corrected Total	1446.811	74				

R Squared = .314 (Adjusted R Squared = .274); F-cri. = 4.121

Table 4 reveals a P value (0.203) and F statistic value (1.682) which is less than the F-critical (4.121). This indicates that there is no significant difference in the mean score of male students and the mean score of female students in multiple choice tests. Hence, the null hypothesis is accepted.

Hypothesis 2:

There is no significant difference in the mean score of male students and the mean score of female students in Essay test.

Table 5: Analysis of Covariance of the Mean Scores of Male and Female Basic Technology Students in Essay Test

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	449.461a	2	224.731	26.764	.000	.619
Intercept	167.689	1	167.689	19.971	.000	.377
PRETEST	446.225	1	446.225	53.142	.000	.617
GENDER (Main Effects)	13.372	1	13.372	1.593	.216	.046
Error	277.094	81	8.397			
Total	10660.000	84				
Corrected Total	726.556	83				

R Squared = .619 (Adjusted R Squared = .596), F-cri. = 4.085

Table 5 is the Analysis of Covariance of the mean scores of male and female Basic Technology students in multiple choice tests. Table 5 reveals a P value (0.216) and F statistic value (1.593) which is less than the F-critical (4.085). This indicates that there is no significant difference in the mean score of male students and the mean score of female students in Essay test. Hence, the null hypothesis is accepted.

Discussion of Findings

Result in table 1 revealed that students who were tested with multiple choice test performed better than students who were tested with restricted essay with a small margin. However, it is not in agreement with the finding of Ntiko (2013), and Okeke (1986) which revealed that multi-choice testing had negative effect on the performance on students.

Result in table 2 and table 3 revealed that female students performed better than the male students in multiple choice and essay tests. However, the test of hypotheses as shown in table 4 and 5 revealed that there was no significant difference in the mean scores of male and female Basic Technology students in multiple choice test and Essay tests. These findings are in line with the findings of Peuker, Brock, & Peuker, (2010) which revealed that female students performed better in multi-choice test format.

Conclusion

Based on the data analyzed, findings and discussion made, it is concluded that test formats differ significantly in their effects on academic performance of students. The type of test used in assessing students has substantial impact on their academic performance**.**

Recommendations

Based on the findings, the following recommendations were made:

1. Classroom teachers, test constructors and other stakeholders involved in test construction should employ both essay and multiple choice questions in order to give students the opportunity to perform well academically.

2. Teacher educators should stress the importance of utilizing both essay and multiple choice questions in preparing teachers. The teachers should be exposed to the best ways to construct both essay and multiple choice questions in the process of their training.

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