EFFECT OF GRAPHICAL INSTRUCTIONAL PACKAGE ON JUNIOR SECONDARY SCHOOL STUDENTS' PERFORMANCE IN BASIC TECHNOLOGY IN OMU-ARAN, KWARA STATE, NIGERIA

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Abstract

The purpose of the study was to find out the effect of graphical instructional package on junior secondary school students' performance in basic technology, in Omu-Aran, Kwara State. The study also investigated the influence of students' gender and ability levels on the performance of students' taught using graphical illustrations. Quasi-experimental design, which involved the pre-test, post-test, non-randomized, non-equivalent control group design, was employed for the study. Sample was drawn from two randomly selected secondary schools. One intact JSS one class each from the sampled schools was also randomly selected for the study. Students from the sampled class were further stratified along gender and ability levels. Three researchers designed instruments: (i) Graphical Instructional Package (ii) Basic Technology Performance Test (BTPT), (iii) Graphical Instructional instruments was used as treatment and test instruments, respectively. The instruments were face and content validated. The test instrument, Basic Technology Performance Test was tested for reliability using test –retest method of three weeks interval Pearson Products Correlation analysis revealed a reliability value of 0.76. The three research hypotheses were tested using Analysis of Covariance. Findings indicated that students taught with graphical instructional package performed significantly better than those taught without the use of the package. It also revealed that the gender of students was not a factor in the performance of students when they were taught using graphical instructional package as there was no significant difference between the performance of male and female students. Based on the findings, it was recommended that: the use of graphical instructional package should be encouraged for teaching basic technology.

Keywords: Graphical Instructional Package, Instructional Package, Basic Technology

Introduction

Educational technology can be used to achieve the objectives of teaching and learning in the 9-year basic education level in Nigeria. This is because educational technology is not just the use of tools of education in resolving instructional challenges but because it is a systematic, integrated organization of machines, (hardware and software) and man (educational administrators, psychologists, teachers, and so on) in remediating instructional challenges (Azubike & Obianwu, 1994 Cited in Issa, 2004).

Myriad of researches into the mechanics of learning have proved that any instructional process of learning which evokes the involvement of as many senses as possible tends to facilitate or ease learning. Wittich and Schuler (1967) in Issa, (2004) defined graphics as the use of letters, drawings, signs and models to communicate messages. Graphics communicate facts and ideas clearly through a combination of drawings, words and pictures. The use of graphics in teaching creates definitiveness to the materials being studied. They help to visualize the whole concept and their relationships with one another. Issa (2004) defined graphical instructional package as a collection of drawings and illustrations that could be used to facilitate the teaching and learning of introductory technology.

Instructional package designers can and should use graphics effectively in their course and document design because educational research has shown that learners learn better from words and pictures than from words alone (Mayer, 2003). The goals of the instruction to motivate, inform, or to build procedural or problem-solving skills strongly influence the value of a graphic. Certain kinds of visuals help learners see the relationships among information in a lesson and in turn help learners build mental models that are basis for higher-level thinking and problem-solving (Kirschner, Sweller, & Clarke, 2007).

Gender refers to the condition of being male or female. That is, boy or girl, man or woman. Human beings generally all over the world are generally classified into two biological groups. So when we talk of gender, we are referring to man or woman as a social group (Tunde-Awe, 2003).

Statement of the Problem

There has been a continuous search for methods of making technology education more relevant, skillful, functional, and reliable in our economic aspiration. The use of instructional materials in teaching and learning is not new. Their shortage in our institutions of learning is not a new issue. Instructional materials play a crucial role in basic technology instruction; they are often neglected in Nigerian secondary schools and technical colleges (Njoku, 1998). The WAEC Chief Examiner's report (2007) also noted that the poor performance of students in technical subjects was below average and this was attributed to inadequate supply of instructional materials and equipment, shortage of qualified teachers and overcrowded classes and workshops. It was also noted that most of the teaching were done in abstraction. The researcher therefore identifies one of the methods of facilitating teaching and learning of basic technology by designing a graphical instructional package. In this study, attempt was made to design and produce a graphical instructional package and investigate the effect of this graphical instructional package on junior secondary school students' performance in basic technology in Omu-Aran, Kwara State.

Purpose of the Study

The main purpose of this study was to find out the effect of graphical instructional package on junior secondary school students' performance in basic technology, in Omu-Aran, Kwara State. Specifically, this study investigated the:

(i) effect of graphical instructional package on the performance of students' in basic technology

(ii) influence of gender on the performance of students taught using graphical instructional package.

(iii) influence of students' ability levels on their performance when they were exposed to graphical package.

Research Questions

In this research, the following research questions were answered.

(i) What effects does the graphical instructional package have on the performance of students in basic technology?

(ii) Does the gender of students influence their performance in basic technology when taught using graphical instructional package?

(iii) Is there any difference in the performance of high, medium and low, scorers exposed to the graphical instructional package?

Research Hypotheses

Based on the research questions the following three hypotheses were tested in this study.

Ho_1: There is no significant difference in the performance of students' taught Basic Technology with the graphical instructional package and those taught with the conventional method in basic technology

Ho_2: There is no significant difference in the performance of male and female students' exposed to graphical instructional Package in Basic Technology

Ho_3: There is no significant difference in the performance of low, medium and high scoring students when they are taught Basic Technology using the graphical instructional package.

Methodology

The quasi-experimental design was adopted for this study. It is a type of research design that is used when the experimenter cannot assign subjects randomly to group as it is often done in the true experimental studies (Akwezuilo & Agu, 2004). Therefore, in line with one of the features of the quasi-experimental designs, the subjects were not randomly assigned into groups in this study. Specifically, the non-equivalent, non-randomized pre-test, post test control group design was adopted for the study. Two intact classes, each from two-co educational schools, were used for the study. Since conventional measures of general ability are not available in Nigerian secondary schools students were stratified into academic scoring levels (high, medium and low) based on their average scores in the Kwara State Common Entrance Examination. A high ability level student according to this study was one whose average scores in the Common Entrance Examination falls within the upper 75% (3^{rd} quartile). The medium ability students fall within the middle 50% (2nd quartile), while student whose scores fell within the lower 25% (1^{st} quartile) were grouped as low ability scoring level students. One of the groups constituted the experimental group and the other constituted control group. Both groups were first pre-tested using the same test materials. Then, the experimental group was taught using the treatment instrument and finally, both groups were post tested using the same test that was used for pre- test.

All the junior secondary schools in Omu-Aran, Kwara State, constituted the target population of the study. There were eleven (11) secondary schools in Omu-Aran, only six out of the schools have basic technology teachers. To make sure that all the schools that offer basic technology had equal chance of being selected for the study, simple random sampling technique was used to select the two schools involved. Intact JSS I classes were used for the study in the sampled schools. This is because the topics of interest are normally taught in JSS I.

Intact groups used for the study had male and female students. Since conventional measures of general ability are not readily available in Nigerian secondary schools, students were stratified into academic scoring levels (high, medium, and low) based on their average score in the Kwara State Common Entrance Examination. A high ability level student according to this study was one whose average score in the Common Entrance Examination falls within the upper 25% (3^{rd} quartile). The medium ability level student score falls within the middle 50% (2^{nd} quartile), while students whose score fell within the lower 25 (1^{st} quartile) were grouped as low ability level students.

The research instruments that were used to gather data for the study were divided into two: (i) Treatment instrument (The graphical instructional package) and (ii) Test instrument.

The treatment instrument was a graphical instructional package, which included drawings and illustrations prepared by the researcher for use with the experimental group. The package was validated by experts in the Department of Educational Technology, University of Ilorin. The topics treated are the processing of materials, the use of bench tools and appliances. The package was prepared based on the lesson notes prepared by the researchers who taught the two groups differently. The test instrument employed in this study was a researcher designed test, titled Basic Technology Performance Test (BTPT). The (BTPT) contained a 25 items with multiple choice questions. It was used to measure the performance of students as pre-test and post-test. The researcher constructed the test items from the past Kwara State Junior Secondary Certificate Examination (JSCE) questions based on the areas covered in the instruction for both experimental and control groups. On scoring, the multiple choice items, the score of one mark was awarded for the correct answer and zero for any wrong answer.

The test instruments was subjected to both face and content validity by five experts in Educational Technology and five experts of Basic Technology from the Department of Educational Technology, University of Ilorin and Department of Educational Technical Education, Kwara State College of Education, Ilorin. The recommendations given by the experts helped the researcher to modify the test instrument. The reliability of the test instrument was determined using the test – retest method. The test instrument that had already been validated were administered on 40 JSS I students who were selected from a co-educational school that was different from the schools that were selected from a co-educational school that were used for the actual study. After an interval of three weeks the test was administered again on the same sample. After this, the two sets of score were

correlated. The reliability was determined using Pearson Product Moment Correlation formula. When it was analyzed, a reliability value of 0.76 was obtained.

The researcher personally administered and conducted the treatment. The treatment used was the Basic Technology Performance Test. The researcher taught both the control and the experimental group alongside verbal explanation for four weeks but the graphical instructional package was not used to teach the control group.

Results

Hypothesis 1: *There is no significant difference in the performance of students' taught Basic Technology with the graphical instructional package and those taught with the conventional method of teaching.*

To test this hypothesis, the ANCOVA statistic was used to compare the post test mean score of the control group with the pre-test serving as covariates. The result is reported in Table 1.

Table 1: ANCOVA on the post-test performance score of the experimental and control groups

Source	Type III sum of square	df	Mean square	F	Sig
Corrected model	4859.7949	2	2429.897	23696	000
Intercept	27724.399	1	27724.399	270369	000
PRE	2185.791	1	2185.791	21316	000*
TREATMENT	1853.527	1	1853.527	18076	000
Error	10049.196	98	102.543		
Total	32034.000	101			
Corrected total	14908.990	100			

Significant at 0.05 alpha levels

Table 1, shows the comparison of post-test mean score of the experimental and control groups. The calculated and control F value of 18076 is significant because the value of .000 is lower than the 0.05 alpha levels this implies that the experimental group exposed to graphical instructional package performed better than the control group taught the conventional method. The hypothesis is therefore rejected.

Hypothesis 2: There is no significant difference in the performance of male and female students' taught Basic Technology with the graphical package.

This hypothesis was tested using the ANCOVA statistic method, to compare the mean scores of students in experimental group (stratified into male and female) with the pre-test scores serving as covariates. The result is as reflected in Table 2.

Table 2: ANCOVA on the post-test mean score of male and female students in the experimental group

Source	Type III sum of square	df	Mean square	F	Sig
Corrected model	16032.595a	2	816.297	8.761	.001
Intercept	13263.418	1	13263.418	142.350	.000
PRE	1622.619	1	1622.619	17.415	.000
TREATMENT	162.190	1	162.190	1.741	.193
Error	4658.726	50	93.175		
Total	196372.000	53			
Corrected total	6291.321	52			

Significant at 0.05 alpha levels

Table 2, indicates that the calculated F value of 1.741 is not significant because the significant value of .193 is greater than 0.05 alpha levels. This result implies that there was no significant difference between post-test mean score of male and female students. That is, male students score when both were taught using graphical instructional package. Therefore, the null hypothesis is accepted.

Hypothesis 3: There is no significant difference in the performance of the low, medium and high achievers when they are exposed to graphical instructional package.

To test this hypothesis, the ANCOVA statistic was used to analyze the mean score of students in the experimental group (stratified into high, medium and low ability levels) with the pre-test score serving as covariates. The result is as shown in Table 3.

Table 3: ANCOVA on the performance of high, medium and low ability levels students in the experimental group

Source	Type III sum of square	Df	Mean square	F	Sig
Corrected model	3308.6059	3	1102.686	18.118	.000
Intercept	16359.700	1	16359.700	268.757	.000
PRE	236.628	1	236.628	3.887	.054
ABILITY	1838.200	2	919.100	15.099	.000*
Error	2982.716	49	60.872		
Total	196372.000	53			
Corrected total	6291.321	52			

Significant at 0.05 alpha levels

Table 3, shows that the calculated F value of 15.099 is significant because .000 significant levels is less than alpha levels. This shows that there is a significant difference in the post-test mean score of the high, medium and low scorers. Therefore, the null hypothesis is rejected.

Discussion

The result from the findings of this research indicated that the students taught with the graphical instructional package performed better than those taught with the conventional

method. The students' gender has no significant influence on students' performance in Basic Technology when they were taught with the graphical instructional package. The findings also revealed that there is a significant difference in the post-test performance of high, medium and low scorers when the students were taught with the graphical instructional package. The findings from this study are similar with those of some researchers. It indicated that visual illustrations have significant effect on students' performance in basic technology. This result agrees with the findings of previous researchers who asserted that visual illustrations do not only enhance communication between learners and teachers but also aids retention. In other words, learners often remember more of what they see and manipulate than ideas that were verbally communicated. This agrees with the findings of Ajayi-Dopemu (1982), Abolade (1993), Azubike & Obianwu (1994), and Yusuf (1997).

Conclusion

Graphical instructional package could enhance the teaching and learning of Basic Technology concepts and acquisition of skills and improve students' performance in the subject. The Gender had no influence on the performance of the students when taught with the graphical instructional package, as both male and female students exposed to graphical instructional package performed equally well. Also, the scoring levels of the learners (high, medium and low) can influence their performance in basic technology when graphical instructional package is used in instruction, but the disparity levels may be lowered, as evidenced in the post-test performance.

Recommendations

The following recommendations arose from the findings of the study:

(i) The use of graphical instructional package should be encouraged in teaching basic technology. This can be done through government and individuals' support to schools.

(ii) Educational technologists should be encouraged to develop graphical instructional packages on topics outlined for junior secondary school Basic Technology.

(iii) Seminars, workshops, and in-service training should be organized for teachers to enable them acquire the necessary skills on the development of graphic instructional packages for classroom instruction.

(iv) Graphical instructional packages on basic technology should be made available to teachers. The Ministry of Education could liaise with the National Educational Technology Centre, Kaduna, or any higher institution resource centre for the production of such media packages.

(v) Textbook writers should improve on the graphical illustrations to be in the production of Basic Technology books.

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