THE EFFECT OF PHYSICAL MODEL ON STUDENTS PERFORMANCE IN DRAIANAGE PATTERN OF NIGERIA IN SENIOR SECONDARY SCHOOLS IN KADUNA STATE NIGERIA

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Abstract

The research was aimed at finding the effect of physical model on students' performance in drainage pattern of Nigeria in senior secondary schools in Kaduna state Nigeria. The research was experimental in nature using 40 SS2 Geography students. The sampled students were grouped into experimental and control group, each group had 20 SS2 geography students comprising of ten male and ten female students respectively. The essence of pre-test was to ascertain the pre- experimental abilities of the sample used for the study. Twenty (20) multiple choice questions were used for data collection as instruments. Experimental group were taught drainage pattern of Nigeria using physical model while control group were taught without the model. The test items were administered to both group in a post- test, results were collated, scored and subjected to statistical analysis using t- test for statistics for testing the hypothesis at 0.05 α level while mean score was used to answer the research question. The results shows that, the experimental group performed significantly better than the control group due to the introduction of physical model as instructional aid in the course of instruction. Therefore, Geography teachers should be encouraged as much as possible to use visual aids such as models in teaching and learning situations. This will enhance better understanding of geographic concepts.

1. Introduction

Geography as a school subject focuses on studying the environment and all its components which include man, places and activities, it relevance and contribution to nation building in any society cannot be overemphasized. As a school subject,Aderogba (2012) noted that, it is one of the most important subjects in Secondary school education because it equips students with a body of knowledge to make them functional and socially relevant in the society though achieving this in many schools today still remains a mirage due to some factors militating against the effective teaching and learning of the geography at the senior secondary school level of education in Nigeria. One of these is the failure on the part of the some school administrators in providing relevant teaching materials for teachers to utilize and the inability of most teachers to utilize teaching materials even where it's available, this has led to poor utilization of teaching materials. Others include the large scope and abstract nature of the subject. Others include the large scope and abstract nature of the subject, assumptions that the subject is difficult to teach and learn and more importantly, there are no readily available teaching materials for effective teaching and learning of the subject to ensure that abstract concepts are made reality to the learners. These probably explain some of the factors. Aderogba (2012) pointed out that death of alien instructional materials for effective teaching and learning of the subject in Nigeria Schools which has led to the poor performance of students in geography in Nigeria and quick to suggest the use of instructional materials in place. This implies that the mastery of geography concepts might not be fully achieved without the use of instructional materials. Damar (2004) opined that the teaching of Geography without the use of instructional materials may certainly result to poor academic performance of student. Instructional materials have been defined by many authors. Isola (2010) referred to them as objects or devices which help the teacher to make a lesson much clearer to the learner. They are also described as concrete or physical objects which provide sound, visual or both to the sense organs during teaching Agina-obu (2005). They can also be said to be materials used by a teacher during lessons to facilitate students understanding in teaching-learning process. Damar (2004).

Teaching materials are of various classes. They could be audio, visual or audio-visual. Visual instructional materials are those that are seen and can be assessed without any form of sound. For examples, the use of still pictures, posters, wall charts, models, chalk boards, text

books etc. Ema&Ajayi (2006). In the same vein, physical models are materials or objects which are likely natural or man- made structures or system which are intended to highlight and explain or describe structures, functional processes and relationships as they appear in their original formOnasanya (2004). Physical models are constructed to provide understanding of the behaviour of the physical world and the causes of such behaviours Onasanya&Adegbija (2007). Similarly, they summarized the role of physical models as bridging the gaps in distance and time between phenomena and class room events and enhancing of students ability to communicate. A very good example of a physical model, which is a map can be used to interpret some concepts in Geography. Similarly, the concept of drainage system of Nigeria will be well understood by students with the help of a physical modelled map of Nigeria, showing the drainage systems.

Drainage systems refers to water bodies like rivers and lakes. Ewene (2006). According to him, Nigeria is drained by two main rivers, rivers Niger and Benue. River Niger, the largest river in Nigeria has its source from Guinea highlands in Guinea, it passes through Mali and Niger Republic to Nigeria. River Benue on the other hand has its source from Eastern highlands and joins the Niger at Lokoja. Other rivers in Nigeria take their sources from highlands in Nigeria known as hydrological centres. They include the Western highlands, which is made up of rivers such as Ogun, Osun and Osse, North Central highlands, made up or rivers like Kaduna, Hadeija, Zamfara, Yobe, Gana, Gongola and Rima, Eastern highlands have rivers Dongo, and Katsina – Ala and Eastern scarplands which have rivers like Anambra and Cross rivers.

1.2 Statement of the Problem

The performance of students in geography over the years in Nigeria has not been encouraging this signifies that little or no learning objectives has been achieved. This trend has been attributed mainly to total absent or inadequate use of instructional materials and the ineffective methods of teaching employed by geography teachers in teaching Geography. The poor performance of students in geography could then be mainly due to geography teacher's failure to use instructional materials which enhances students learning. Other factors include poor quality and quantity of teachers and students poor attitude and interest towards geography. Non – utilization of instructional materials makes geography lessons boring and uninteresting which leads to lack of understanding on the part of the students. The problem of this research work is to investigate

what instructional materials will be used to boost student interest and learning of drainage system of Nigeria.

1.3   Purpose of the Study

This study is aimed at finding the effects of physical modelled map of Nigeria showing drainage pattern on the academic performance of geography students in kaduna state Nigeria. Specifically, the study will find out:

i.   The effect of physical model on student's performance in drainage pattern of Nigeria.

ii.   The effects of physical model on student's diagrammatic presentation of Nigerian drainage pattern on a map.

1.4   Research Questions

The researchersseek to answer the following questions.

i.   What is the performance of students taught Nigerian drainage pattern using a physical model?

ii.   What is the performance of student in terms of diagrammatic presentation between those taught drainage pattern with the modelled drainage map of Nigeria and those taught without the model?

1.5   Research Hypotheses

The following hypotheses were tested at 0.05 level of significance with 95% confidence level.

$H0_1$ =   There is no significant difference in performance between students taught Drainage pattern of Nigeria with physical model and those taught without it.

$H0_2$ =   Physical Model of Nigeria drainage pattern has no Significant effect on students' performance diagrammatically between students taught with model and those taught without the model.

1.6   Delimitation

The study was designed to find out the effects of visual teaching materials (Physical Model) on the academic performance of geography students in kaduna state and the study was limited to a secondary school randomly selected in the area. The population

of the study comprised of all the senior secondary school (SSSII) students in the study area. The sample consisted of the students drawn from the sampled school.

2. Research Methodology

2.1 Research Design

The research design adopted for the study was quasi – experimental which consist of the pre- test and post -test control group. The experimental group was taught the topic drainage pattern of Nigeria using a physical modelled map while the control group was taught the same topic without the use of a physical model. The essence of pre-test is to ascertain the pre-experimental abilities of the sample group drawn for the study while post- test is to compare the performance of students.

2.2 Population, Sample and Sampling Technique

The Population of study comprised of all the (284) approved senior secondary schools in kaduna state and all the Senior Secondary School (SSSII) geography students.The sample consisted of one Senior Secondary School due to the nature of the research design. 40 students out of 1448 geography students were randomly selected and assigned into two (2) groups. Twenty (20) students each to form the experimental and control groups respectively.The researchers used simple random sampling technique in choosing the sample from the target population, where members of the population have equal chance of being selected in the sample. The sample as mentioned was drawn from one senior secondary school in the study area. Individual were assigned numbers from 1-40, all those who picked odd numbers formed the experimental group while even numbers form the control group.

2.3 Instrument for Data Collection

A geography performance test (GPT) was used as instrument for data collection. The performance test in geography contained 20 items of multiple choice (objective test) question in section (A) and two (2) theory questions to test the drawing skills and ability of the students in section (b). The students were made to select the correct answer from four (4) options. The essence of the (GPT) was used to measure the performance of students in both pre-test and post-test. Some intervening variables extraneous to the study such as teacher effect, group interaction effect were controlled by the presence of the researchers and the subject teacher in the school.

Each correct option picked by the students, 2 marks are awarded in section A and in section B, each accurate diagram 5 marks are given to the students.

2.4   Validation of Instrument

The instrument for data collection was validated by the researchers and questions were amended and at the end, twenty (20) multiple choice questions and two (2) theory questions were sustained out of 32. The test items were administered to a separate school out of the study area, test scores were collated and subjected to statistical analysis using the split half formula to establish the reliability coefficient (r- coefficient) which an alpha of 0.86 was obtained. The physical model used in teaching was also validated.

2.5   Procedure for Data Collection

Both the pre-test and post – test were administered by the researchers with 2 other researchers assistants trained in facts and content of the study to all the SSII geography students assigned for the study. The Pre- test was administered before the commencement of the study while the Post – test was administered after the study which lasted for a period six (6) weeks. The study was done with permission from the school authority.

2.6   Method of Data Analysis

Mean scores and t-test statistical analysis were used for analysis of data. Scores of the different groups were computed and used in testing the hypothesis with an alpha level of 0.05 (α= 0.05). This level of significance formed the basis for rejecting or accepting each of the hypothesis.

3. Results

Table 1: Analysis of pre-test mean scores for control and experimental Group.

Sample group	N	DF	x	$\bar{x}$	t-cal	t-critical	$\propto$
Experimental group	20	38	80	4.00	0.153	2.021	0.05
Control group	20		77	3.85			

Table 1: Shows that the total scores of students in experimental group was 80 with a mean $\bar{x}$ scores of 4.00 while that of control group 77 with a mean ($\bar{x}$) score of 3.85. The t-calculated value as shown in table 1 is less than the t-critical value (0.153<2.021). This indicates that there is no significance difference at 0.05 level of significant between the means score of the

experimental and control group which signifies that the two group has similar entry level with regard to academic ability before the treatment proper.

3.1   Research Question One:

What is the performance of students taught Nigerian drainage pattern using a physical model?

Table 2: post-test experimental and control Group.

Sample group.	N	x	$\bar{x}$
Experimental group	20	332	16.60
Control group	20	198	9.90

Table 2: shows that, experimental group score 332 with a mean $(\bar{x})$ score of 16.60 while the control group has a score of 198 with a mean $(\bar{x})$ of 9.90. the mean $(\bar{x})$ difference between the experimental and control group is 6.70. This indicate that, experimental group performed better than control group as seen in table 2. This answered research question one(1).

3.2   Research Question Two:

What is the performance of students in terms of diagrammatic presentation of drainage pattern of Nigeria between those taught with the modelled drainage map of Nigeria and those taught without the model?

Table 3: post-test result for experimental and control group

Sample group	N	x	$\bar{x}$
Experimental group	20	200	20.00
Control group	20	146	14.60

Table 3: Shows the performance of experimental and control group. The mean $(\bar{x})$ score of experimental group is 20.00 with a total score of 200 while the mean $(\bar{x})$ score of control group is 14.60 with a total score of 146. The mean difference is 5.40. This indicates that experimental group performed significantly better than the control group. Therefore, there is a difference in the diagrammatic presentation of drainage pattern of Nigeria between those taught with a modelled drainage map of Nigeria and those taught without it. This answered research question two(2).

3.3   Testing Hypotheses

3.3.1   Ho₁: Hypothesis one: physical model of drainage pattern has no significant effect on student's academic performance in drainage pattern of Nigeria.

Table 3: post-test result for experimental and control Group.

Sample group.	N	DF	x	$\bar{x}$	t-cal	t-critical	$\propto$
Experimental group	20	38	332	16.60	3.401	2.021	0.05
Control group	20		198	9.90			

The result obtained in table 2: shows that, the t-calculated value is greater than the t-critical value (3.401>2.021). This means that those in experimental group performed better than the control group. The null hypothesis one is thereby not accepted. Therefore, there is a significant effect on students' academic performance in drainage pattern of Nigeria when taught with physical model as instructional aid.

3.3.2 Ho$_2$: Hypothesis Two: Physical model of Nigerian drainage pattern has no significant effect on student's performance diagrammatically between students taught with the model and those taught without the model.

Table 3: post-test result for experimental and control group

Sample group	N	DF	x	$\bar{x}$	t-cal	t-critical	$\propto$
Experimental group	20	36	200	20.00	2.015	1.734	0.05
Control group	20		146	14.60			

Table 3: shows that, the t-calculated value is greater than the t-critical value (2.015>1.734). Since the t-calculated is greater than t-critical, the null hypothesis two is hereby rejected. Therefore, there is a significant difference in the diagrammatic presentation of drainage pattern of Nigeria between those taught with physical model and those taught without the model.

4. Discussion

The aim of this research work is to investigate the effects of physical model of drainage pattern of Nigeria on the academic performance of students in geography. Mean score was used to answer research questions while the null hypothesis generated were statistically analyzed and interpreted at 0.05 level of significance to reject or accept the proposed hypotheses, hence, the interpretations and decisions were taken with 95% confidence.

The hypotheses tested statistically shows that there is a significant difference in the mean score of students taught drainage pattern of Nigeria with a modelled map and those taught without the model. The use of a modelled map of Nigeria's drainage helps the teachers to make lessons easier and also saves time. This also makes geography an interesting subject to the learners and to the teacher. Information is also transmitted easily. The use of modelled map of Nigeria's drainage improves the performance of students in learning geography especially those that were taught with it and also serve as a motivation to the study of geography.

The result obtained in table 2: revealed that, the experimental group scored a total of 332 with a mean of 16.60 while the control group score 198 with a mean of 9.90. These result indicates that students taught with the model (experimental group) performed significantly better than students taught without the model (control group). It was observed that the use of model has positive effects on the student's performance. Research hypothesis two emphasized on the difference in performance of students in the presentation of diagrams showing drainage pattern of Nigeria between students taught with the model and those taught without the model. Table 3 clearly shows that the experimental group performed significantly better than the control group. This signifies that physical model plays a vital role in understanding of geographic concepts, fact and knowledge.

5. Conclusion

The following conclusions were drawn from the major findings of the study.

i.   The performance of students in experimental group was in upward projection due to the use of modelled map of Nigeria's drainage pattern compared to students taught without the model (Control group).

ii.   Using visual instructional aid (model) saves time, making teaching effective and improve the performance of student in geography.

iii.   Geography is seen as abstract and so many students have negative feelings towards it but the use of a modelled map showing drainage pattern of Nigeria increase students enthusiasm and active participation during the lesson, students showed that they were happy and seem to have a better understanding than the conventional method of using only chalk talk.

iv.   The major finding and observation of this study revealed that student taught with physical model performed better than those taught without model as instructional materials both theoretically and practical wise (drawing of map of Nigeria showing the drainage pattern).

v.   Inappropriate teaching method and lack of effective utilization of materials contributes a lot to the failure of students offering geography in senior secondary schools.

6.   Recommendations

The following are possible recommendation made from this research work.

i.   Geography teachers should be encouraged as much as possible to use visual aids such as models in teaching and learning situations. This will enhance better understanding of geographic concepts.

ii.   Physical models can be employed in other related areas in geography such as regional and human geography as well as other science subjects.

iii.   The model should be improved upon by other researchers, little fund should be provided by government and school authorities for the production of instructional models.

iv.   Geography teachers should engage themselves in improvising materials needed for geographic instructions, since they exactly know what is required for effective teaching and learning process.

v.   Schools and government should aim at providing models and other peripherals needed for effective and efficient utilization of models in teaching and learning of science related subject including geography.

vi.   Curriculum developers should take full account of the potentials of new technology to contain what is used in learning situation.

vii.   The education authorities, concerned individuals and organizations, ministries and government of the country should invest in the production of indigenous instructional materials to help the education sectors enhance teaching and learning process.

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