

Effects of Computer Simulation Instructional Package on Achievement of Senior Secondary School Geography Students in Map Reading in Bida, Niger State, Nigeria

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Abstract

This study investigated the effectiveness of Computer Simulation Instructional Package (CSIP) on secondary school Geography students' achievement in map reading in Bida, Niger state, Nigeria. Quasi experimental design was employed. The sample size of the student in the experimental group was eighty two (58 male and 24 female) students while seventy eight (50 male and 28 female) students were in the control group. This gave the total sample size of one hundred and sixty (160) intact SS II geography students. Two research instruments were used in this study: (i) Map Reading Achievement Test (MRAT); (ii) Computer Simulation Instructional Package (CSIP). The instruments were validated by experts. The Pearson product moment correlation (PPMC) formula yielded 0.83 reliability coefficient for MRAT. Two research questions were raised and two hypotheses were tested. t-test statistics was used to test the hypotheses at 0.05 significant level. Findings revealed that students taught geography through CSIP perform better than their counterparts taught using lecture method. However, there was no significant difference in the achievement of boys and girls taught using the package. The package was therefore recommended to be used by geography teachers and students with a view to improving students' achievement in geography.

Keywords: Achievement, Computer, Geography, Instruction, Map reading, Simulation

Introduction

Information and Communication Technology (ICT) occupy a predominant position in the contemporary world today. In fact, modern ICT have brought revolution in the field of education, industry, service organization, telecommunication and various other fields affecting our day-to-day activities (Mangal & Mangal, 2013). Adegbija and Falode (2014) pointed out that the use of (ICT) has seen tremendous growth in the recent past because of its significant impact on all areas of human endeavors. The field of education is not left out as technology has positively affected teaching, learning, and research in many ways. Furthermore, ICTs is seen to have the potential to accelerate, enrich, and enhanced skills, to motivate and engage students, to help relate school experience to work practices, create economic viability for tomorrow's workers, as well as strengthening teaching and helping schools change for the better in the knowledge-base society and in the global world.

Today, people are living in a knowledge-base society globally where knowledge is a great power, economy and strength of an individual and asset of a nation (Mangal & Mangal 2013). Mangal viewed ICT as a technology employed in the form of tools, equipment and application support which helps in the collection, storage, retrieval, use, transmission, manipulation and dissemination of information as accurately and efficiently as possible for the purpose of enriching the knowledge and develop communication, decision-making as well as problem solving ability of the user. For these reasons, Nigerian government gave priority to science and technology with policies that are favourably disposed to science and technology education and this is reflected in the National Policy on Education by Federal Republic of Nigeria (FRN, 2009). In furtherance to government support for science and technology education, Information and Communication Technology (ICT) which is an integral aspect of science and technology is adopted by the policy to apply to all levels of education (Falode, 2014).

Michael (2000) observed that technologies resulting from computer simulation offers learners several advantages, it can for instance, provide the students with the opportunity to engage in activities that may

not be possible, enhance academic performance and the learning achievement levels of students, and be equally efficient as real-life hands-on laboratory experiences. Computer simulations give students the opportunity to take initiative when learning about a given topic like map reading. Therefore, the success of computer simulations depends on compatibility with the curricula as well as teachers' effectiveness in its utilization (Sahin, 2006; Yilmaz, 2007). In a related study as reported by Strauss and Kinzie (1994); Sadler, Whitney, Shore and Deutsch, (1999); Stieff and Wilensky, (2003); Garcia-Lugue, Ortega, Forja, and Gomez-Perra. (2004) suggested that well-designed computer simulations have positive effects on learning, creativity, decision-making, communication, thinking power and initiatives.

Geography has continued to play significant role in the national development. It is taught in schools to give learners a sound knowledge of their immediate environment and develop in them the ability to comprehend and explain natural phenomena. Obondo, Nabwire and Jaction (2013) opined that geography is seen as a subject that develop learners' critical thinking ability and to comprehend spatial relationship among various features on the surface of the earth, most importantly in problem solving and further prediction of the environmental phenomenon.

Today more than ever, the fields of knowledge are dependent on geography for solving problem and predicting outcome of our environment. Cochran and Miller (2013) opined that it is the science of place and space as such it give emphasis to where things are located on the surface of the earth, why they are located where they are, how places differ from one another, and how people interact with the environment. It is, quite simply, about the world in which we live. Also, geography is unique in bridging the social sciences (Human geography) with the natural sciences (Physical geography).

In spite of effort put by teachers to effectively teach Geography, in secondary schools, the result is not satisfactory. Obondo *et al.* (2013) revealed that prevailing poor performance by students in geography is as a result of misconception they hold about some topics in geography and instructional mode. He added that, conventional approach which is widely used need to be integrated with technological innovations in teaching to alleviate the situation of low enrolment and conform to expected national quality and standard in Geography. Also, secondary school students complained about geography especially, map reading as being difficult. Therefore, teaching of some units such as physical geography and map reading remains a challenge to teachers as students do not score well in such units (Obondo *et al.*, 2013). This means that the basic foundation of geography is very weak which is carried forward to final class which has culminated to poor academic achievements in Senior Secondary School Certificate Examination (SSCE), West African Examinations Council (WAEC) and National Examinations Council (NECO).

Many researchers have come out with useful findings on the causes of student's poor academic achievement in secondary schools. For instance, Sofowora and Agbedokun (2010); Obondo, Gaudence, Jaction and Violet (2013); NECO 2009-2011 observed that the study of geography from its inception was through verbal description of geographic features, which made the study very abstract and quite uninteresting. Also the undue emphasis on theoretical aspect of Geography to the detriment of scientific and experiential approach had made the subject very unclear and boring that, of all the subjects in the school curriculum at secondary level in Nigeria, Geography seems to be the most difficult subject to teach. Some of the reasons for these as put forward are, nature of the subject and the way it is being taught. It is believed that Geography is taught in a way that discourages open questions, inquiry and active participation. The resultant effect of all the above is that the subject no longer attracts young scholars due to the dull, uninspiring and stereotyped approach being adopted (Sofowora & Agbedokun, 2010).

Similarly, the direct impact of using lecture method on learners often leads to lack of understanding and this might cause poor performance and low enrolment of students in geography (Onasanya, Ahmed & Oputa, 2002). It is also observed by the chief examiners' report of National Examination Council (NECO) that, the problem affecting achievement in geography can be attributed to lack of qualified teachers to handle geography, poor teaching delivery method of presenting the content of the curriculum to students (NECO Chief Examiners' Report, 2010). Consequently, Sofowora and Egbedokun (2010) advocate for a change in instructional delivery modes. the use of computer packages as modes of instruction may be of paramount importance in teaching geography in Nigerian schools. In view of these, a lot of studies have been carried out with respect to the use of computer packages as medium of instruction in Nigeria, one of such studies was carried out by Idoko (2009) who observed that the traditional teaching method prevalent

in Nigerian schools have been found to contribute to students' poor achievement. As such, Asthana (2012); Ho (2009) and Falode (2014) suggested that one way to bring about more practical change in the attitude of learners to geography is by using student centered approach through the integration of computer assisted instruction approach to teaching and learning process.

Gender has been acknowledged as one of the attribute that effects student's achievement in science subjects at senior secondary school level. Research findings have shown contradictory views in this respect. Whereas, some studies show that gender does not affect students' academic performance as discovered by Tabassum (2004); Onasanya, Daramola and Asuquo (2006); Gambari and Mogbo (2006), Iwendi (2009); some also go in favour of male students as revealed by Ifamuyiwa (2004) and Anagbogu and Ezeliora (2007) and Iwendi (2009).

The research conducted by Mitra and steffeensmeier (2000) on gender and computer use in an academic institution where all students were provided with network access and laptop computers over a four year period. The results indicated that women were less positive about computers than men and the use level of computers by women were less frequent than for men. In view of the above, this study attempted to determine the effectiveness of computer simulation instructional package on secondary school Geography students' achievement in map reading in Bida, Niger state, Nigeria.

Statement of the Problem

Several studies as reported by Idoko (2007), Sofowora and Egbedokun (2010), Obondo, Gaudence, Jaction and Violet (2013), NECO 2009-2011 revealed poor academic achievement of students in geography despite the importance attached to the subject in the National Policy on Education (FRN, 2009). The students' performances continue to deteriorate year after years. This have become a source of concern to all stakeholders in Nigerian education system, because no teacher in Nigeria that teaches geography, particularly map reading at any stage, from SS1 to SS3 can prove that the teaching and learning of the subject is effective. Those who teach subjects requiring the application of geography complained of the challenges they face. One of such challenges as stated in the NECO Chief Examiner's Report of 2009 was little knowledge of the content of the Geography syllabus and general phobia for questions that require diagrams, sketches and maps.

Again, poor method of instruction makes teaching and learning of Geography concept confusing and unfamiliar thereby make students see Geography as a collection of "dead statements" presented as fact (Sofowora & Agbedokun, 2010). Also students are just made to learn geography concepts in the abstract form and are subjected to too much imagination of geographic features instead of learning through practical observation. These have become a thing of worry to school administrators, curriculum developers, government, parents and teachers. Based on the above stated problems of teaching and learning of Geography resulting in poor performance, It is against this background that this study investigated the effects of Computer Simulation Instructional Package on achievement of secondary school geography students' in Map reading in Bida, Niger State, Nigeria.

Aim and Objectives of the Study

The aim of this study is to determine the effects of Computer Simulation Instructional Package on achievement of secondary school geography students' in Map reading. Specifically, the study was carried out to achieve the following objectives.

1. determine the effects of computer simulation instructional package on the achievement of secondary school geography students in map reading;
2. find out whether gender has influence on the academic achievement of students in geography when taught map reading using computer simulation instructional package;

Research Questions

The following research questions were raised for the study.

1. Is there any difference in the mean achievement scores of geography students taught map reading using Computer Simulation Instructional Package and those taught with lecture method?
2. Is there any difference in the mean achievement scores of male and female geography students taught map reading using Computer Simulation Instructional Package?

Research Hypotheses

The following hypotheses were formulated and tested at 0.05 alpha level of significance.

- Ho₁: There is no significant difference in the mean achievement scores of geography students taught map reading using Computer Simulation Instructional Package and those taught using Lecture Method.
- Ho₂: There is no significant difference in the mean achievement scores of male and female geography students taught map reading using Computer Simulation Instructional Package

Methodology

The study adopts a quasi-experimental research design, in which pre-test, post-test non-equivalent group design was used specifically. The design entails the use of non-randomized sample where the researcher cannot randomly sample and assign subjects hence intact classes were used. This is because it was not possible to randomize the subjects of the study without disrupting the school programmes, therefore two separate intact classes were used as experimental group and control group respectively.

The population for this study was made up of all the 6,209 Geography students in the eleven (11) Senior Secondary school of 2014/2015 session in Bida Metropolis, Niger state. The target population was senior secondary geography students in SSII. The choice of SSII is based on the fact that the concept to be taught falls under their syllabus and scheme of work. The sample of this study was made up of one hundred and sixty (160) students from two (2) selected co-educational senior secondary schools in Bida Metropolis. The schools were drawn through purposive sampling; the reason for purposive sampling of the schools is to select schools with a computer laboratory, These schools are believed to share common environmental conditions such as manpower, gender composition, exposure to the use of computer, enrolment of students for SSCE Geography examinations for a minimum of ten years and school type (public schools). The selected co-educational schools were randomly assigned each to experimental group (using Computer Simulation Instructional Package) and control group (using Lecture Method).

At the school level, one intact SSII geography class was selected from each of the schools. The sample size of the student in the experimental group was eighty two (82) (58 male and 24 female) students captured from the intact class. Similarly, seventy eight (78) (50 male and 28 female) students in the intact class of the second school tagged control school form the sample size for the control group. This gave the total sample size of one sixty (160) students. The data collected was analyzed using inferential statistics. t-test was used to test the hypothesis, mean and standard deviation was used to answer research question using Statistical Package for Social Sciences (SPSS) version 20, the significance of the statistical analyses was ascertained at 0.05 alpha level of significance especially where there is significant difference to test the research hypothesis. Three research instruments were used for this study, They are: treatment instrument (Computer Simulation Instructional Package), Test instrument (Map Reading Achievement Test MRAT), and Questionnaire on attitude of students towards geography (QASG).

A simulation Instructional Package on Secondary School Map reading was developed by the researcher using Simulation software, Microsoft Word, Adobe Flash professional (modern, high-level multi-media, general-purpose application for building multimedia applications using Action-Script) and the .NET Framework. Speech synthesis which is the artificial production of human speech was used to simulate the instruction. The package contained four Geography lessons on the concepts of Map reading. That is, map enlargement, reduction, measurement of distance between two places on the map and measurement of regular area of a map.

The CSIP package consists of topics which were subdivided into four lessons, all from Senior Secondary school (SSII) curriculum. This was presented to the experimental group supported with narration and simulation. The menu of the package consists of objectives, background instruction, and students' registration, list of lessons that is, lesson 1,2,3,4 and exit. It adopts the drill and practice modes of the computer simulation instruction. The CSIP package was installed on laptop /desktop computer. The geography contents (map enlargement, map reduction, measurement of distance and calculation of area on a map) were presented through the computer and the learners interact and respond to the computer base on the instruction. The learners perform a specific task on each of the unit after which the students try some multiple choice-objective questions. Each of the lessons is presented by the computer through interactive

mode and immediate response/feedback to the questions. The learner could only progress further in the lesson on the condition that the questions are successfully answered. This allows learner to have adequate mastery of one topic before moving on to the next. If after three attempts they could not get the answer correctly, the package immediately provide answer before the learner continues.

MRAT consists of 20 multiple choice objective questions. Each item of the instrument is a multiple-choice objective question with four options (A-D) as possible answers to the question. Students were required to indicate the correct answers by ticking on the correct letter (A-D) that corresponds to the correct option for each item. This instrument was administered to the experimental and control groups as pre-test and again for the post-test. To reduce the retest effects, the questions were reshuffled and administered in a different random order in the pretest and posttest. On the scoring of the multiple-choice items, '1' was awarded for each correct answer and '0' for each wrong answer. Computer Simulation Instructional Package was validated by two Educational Technology experts in the department of Science and Technology Education, Federal University of Technology, Minna. Map Reading Achievement Test (MRAT) was validated by two geography experts from Geography Department of Ibrahim Badamasi Babangida University, Lapai, and Geography teachers from secondary school not among the schools in the study area for adequate coverage of the subject matter content and logical arrangement of items.

To test the reliability of the instruments, pilot test was conducted within the targeted population but outside the school sampled for the study. The result obtained from pilot test conducted was used for reliability test of the instruments. The test was administered to 30 SS II students, (22 male, 8 female) randomly selected using test retest method. Pearson Product Moment Correlation formula was used to determine the reliability coefficient of MRAT which yielded 0.83

Results

Hypothesis one

There is no significant difference in the mean achievement scores of geography students taught map reading using Computer Simulation Instructional Package and those taught using Lecture Method.

Table 1: Mean, Standard Deviation and t-test Result of Experimental and Control Group Taught Map Reading using Computer Simulation Instructional Package at Pretest and Posttest.

	Group	N	df	\bar{X}	S.D	t	P	Remark
PRE-TEST	Experimental	82		46.29	13.595	0.52 ^{ns}	0.70	N/Significant
	Control	78		47.38	13.011			
			158					
POST-TEST	Experimental	82		81.98	5.282	15.280	0.02	Significant
	Control	78		65.72	7.969			

*: Significant at 0.05

Table 1 shows the t-test comparison of mean achievement scores of students in both the experimental and control group at the commencement of the study. The table reveals that the t-value ($t=0.52$, $df=158$, $p>0.05$) was not significant at 0.05 alpha level at pretest. This indicates that there is no significant difference in the mean achievement scores of geography students taught map reading using Computer Simulation Instructional Package and those taught using Lecture Method at pretest. Hence, both experimental and control groups are equivalent at the commencement of the study and are comparable. At Post- test, the t-value ($t=15.28$, $df=158$, $p<0.05$) for the two group was significant at 0.05 alpha level. Therefore, Hypothesis one was rejected. This implies that computer simulation instructional package improved students' achievement in map reading better than lecture method.

Hypothesis Two

There is no significant difference in the mean achievement scores of male and female geography students taught map reading using Computer Simulation Instructional Package.

Table 2 Mean, Standard Deviation and t-test Score of Male and Female Students Taught Map Reading using Computer Simulation Instructional Package at Pretest and Posttest.

	Group	N	df	\bar{X}	S.D	t	P	Remark
PRE-TEST	Male	58	80	49.24	11.544	2.12 ^{ns}	0.382	N/Significant
	Female	24		43.50	10.091			
POST-TEST	Male	58	80	83.10	7.492	5.00 ^{ns}	0.139	N/Significant
	Female	24		79.04	9.998			

NS: Significant at 0.05

From the table 4.2 above show the t-test comparison of mean achievement scores of male and female students in both the experimental and control group at the commencement of the study. The table reveals that the calculated t-value ($t = 2.12, df = 80, p > 0.05$) was not significant at 0.05 alpha level. At pretest this indicates that there is no significant difference in the mean achievement scores of male and female geography students taught map reading using Computer Simulation Instructional Package. Hence the two groups are comparable. In addition, at Post- test, the Experimental group t-value ($t = 5.00, df = 80, p > 0.05$) there was no significant at 0.05 alpha level Therefore, Hypothesis two retained. This implies that computer simulation instructional package improves both male and female students' achievement in map reading.

Discussion of findings

The finding of this study on the effectiveness of computer simulation instruction package on students' achievement in geography revealed that students taught map reading using CSIP performed significantly better than their counterparts taught s using lecture method. This finding is in agreement with the earlier findings of Idoko (2009) who observed that the traditional teaching method prevalent in Nigerian schools have been found to contribute to students' poor achievement

The result of the findings of this study on influence of gender on the academic achievement of students taught map reading using CSIP revealed that there was no significant difference between the performance of male and female students taught map reading using CSIP. Hence this finding is contrary to the findings of finding of Mitra et al, 2000; Achuonye and Olele, 2009; who found in their studies at various times, that male students achieved significantly better than female students in science education among others

Conclusions

Based on the findings of this study, it can be deduced that the use simulation instructional package for teaching and learning of secondary schools' map reading has positive effect on students' academic achievement in geography and is gender-friendly. Through the use of simulation-based instructional media, geography instruction can be easily delivered to learners in inspiring, understandable and exciting ways. This will undoubtedly positively improve students' achievement in geography regardless of their gender. Computer simulation instructional package, if adopted by teachers and students can therefore be used to supplement classroom instruction in geography.

Recommendations

Based on the findings of this study, the following recommendations were made:
 Geography teachers should adopt and utilize the developed computer simulation instructional package in teaching and learning of geography as this will help to improve their students' achievement in map reading.

- i. Students should utilize the opportunity offered by the package to engage in individualized study. The developed computer instructional package can be utilized for independent study, and also useful for revision and remedial purposes.
- ii. Development of innovative learning approaches such as simulation-based instruction should be integrated into the curriculum of teachers' education programme in Nigerian tertiary institutions in-order to prepare pre-service-teachers for effective and efficient teaching later in field.

- iii. Regular trainings should be organized by school administrators in form of seminars, conferences and workshops for teachers and students in Nigerian secondary schools. This will enable them capable of developing, utilizing and maximally benefit from relevant technological innovations in teaching and learning processes.

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