EFFECTS OF COMPUTER BASED SIMULATION TEACHING APPROACH ON NCE STUDENTS' ACADEMIC ACHIEVEMENT IN MEASUREMENT AND EVALUATION IN AKWA IBOM STATE COLLEGE OF EDUCATION, AFAHA NSIT

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Abstract
The study examined the effect of computer-based simulation teaching approach on NCE students' academic achievement in Measurement and Evaluation in Akwa Ibom State College of Education, Afaha Nsit. The design of the study was the quasi-experimental design of 'static-group pretest – posttest design. The population of the study was all the students that wrote 2021/2022 second semester examination in EDU223 (Measurement and Evaluation), the number was 907. Two schools whose students performed worst in the said Examination were purposively selected for the study, the sample size was 87. Two research questions were answered and two hypotheses tested at 0.05 level of significance were formulated to guide the study. Two instruments: computer-based simulation (CBS) module and Measurement and Evaluation Test (MET) were utilized in the study. The reliability of 'MET' was established using test-retest method which gave a reliability coefficient of 0.95. Mean and standard deviation were employed in answering the research questions. Analysis of covariance (ANCOVA) was used to test null hypothesis one while independent t-test was used to test null hypothesis two. The findings revealed that students taught 'Basic Statistics' (a topic in Measurement and Evaluation) using computer-based simulation approach performed significantly better than those taught with the traditional talk-chalk method. Also, there was no gender effect on the students taught Basic Statistics using computer-based simulation approach. Based on the findings, it was recommended among others that computer-based simulation approach should be employed in teaching students most of the subjects and topics that are not easily understood when taught using the traditional approach of talk-chalk (talking and writing on the board).

Key words: computer-based, simulation, approach, students, academic achievement

Introduction

Measurement and Evaluation is a compulsory course in the Nigeria Certificate in Education (NCE) Minimum Standard (Curriculum). The course is usually taught in the second year of the NCE Programme and is one of the core courses that enlighten the would-be teachers on most of the activities they will encounter in their profession as teachers. Educational Measurement and Evaluation can be seen as a course that gives teachers insight about the management of the much quantitative data produced during the process of teaching and examining teaching outputs. Okoro and Opa (2011) asserts that

measurement and evaluation are essential parts of teaching and learning process that check the suitability of teaching method, curriculum contents and the quality of learning outcomes.

Gronlund in Joshua (2009) defines measurement as a process utilized to get a quantified representation of the degree or level to which a person reflects an attribute, trait or behavior. Joshua (2009) added that it is a process of describing events, objects, things and people and expressing it quantitatively using numbers or scores. Evaluation on the other hand is defined as the systematic process of judging the worth, desirability, effectiveness or adequacy of something according to definite criteria and purposes (Joshua, 2009). In a school setting, evaluation can be seen as the systematic process of collecting, analyzing and interpreting information to determine the extent to which pupils/students are achieving the instructional objectives. When students are achieving the instructional objectives, it will be reflected in the scores they make in tests/examinations that are properly supervised.

Okoro and Ezeanyim (2018) assert that about 60% of the content of Educational Measurement and Evaluation involve computation and analysis. This is very true because the would-be teachers are trained to handle statutory records like the pupils/students registers and broadsheets even pupils/students report cards. These records and others in the school setting require a teacher to be well grounded in computation and analysis. For instance, a teacher that does not know how to calculate the mean of a set of numbers cannot effectively produce pupils/students results on time because he/she will look for someone else to do that for him/her.

It is not a gain saying, for a Nigeria Certificate in Education student to graduate from college, he/she is expected to pass Educational Measurement and Evaluation. In the college where the researcher is, students complain of having difficulty in understanding the much computation involved in the course. This does not imply that the lecturers do not know what to teach, rather other factors of which 'teaching approach' could be one. According to Mondol (2005), there are two main approaches in teaching – Expository (transmission) and discovery (heuristic) teaching approaches. In most Colleges of Education as far as Nigeria is concerned, the teaching of this course has continued to be expository. Ngwoke in Omoedu, Adolphus and Agbigo (2022), posits that learning involves three major processes: Acquisition of incoming information, transformation of the information into usable form and examining/analyzing the fitness of the transformed information. For these three processes to take place, the learner has to be allowed to be an active participant, that is, the teaching should be delivered heuristically rather than expositorily.

In recent years, it can be agreed that computer simulation presents a more discovery approach. Dauda in Omoedu et al (2022) opines that simulation is an instructional strategy (teaching method) that can be employed with appropriate learning materials at any level from the primary grades through graduate studies. According to Bellow, Ibi and Bukar (2016), effective instructional method stimulates learners' interest hence results in better achievement of the desired curriculum objectives. Simulations motivate students and

make them active participants in the learning process. Computer-based simulation (CBS) is able to handle specific dynamic and complex concepts that are extremely difficult to explain using the talk-chalk approach. This aspect of Information and Communication Technology (ICT) provides powerful tools to support the shift from teacher centered to learners centered paradigm (Holbrook, 2011). When considering gender effect on the performance of students in Mathematics related courses, some people usually believe that boys most times perform better than girls. However, in this research, the pretest scores of the boys were also as low as that of the girls.

Findings of many lecturers and specialists in Educational Measurement and Evaluation have revealed that many NCE students have interest for the course but failed the course after writing the examination at their 200 level. Some even carry over the course more than three times. Interviews with the students also revealed that some of them have not been able to complete the programme as a result of their continuous failure in the course. The Federal Republic of Nigeria (FRN, 2014) stated that the minimum qualification for teaching in Nigerian schools should be the Nigeria Certificate in Education (NCE). Holders of NCE are to teach at the Universal Basic Education (UBE) level; primary school to junior secondary school. The difficulties experienced by these NCE students in understanding the much statistical computations involved in Educational Measurement and Evaluation may not have anything to do with the lecturers teaching the course as the course is supposed to be handled by specialists in the field. The researcher thinks that the method used by the lecturers may be the challenge. The thought is what prompted the researcher to attempt to investigate the effect of computer-based simulation teaching approach on NCE students' academic achievement in Measurement and Evaluation using Akwa Ibom State College of Education as a case study.

The theory of instruction by Bruner guided the study. Bruner was one of the 20th century's most influential Educational Psychologists. The theory describes learning as a process in which a learner actively explains principles or rules underlying an event or object and experiment on them. The theory does not just see learning as a thing one obtains only through reinforcement. Ngwoke in Omoedu et al (2022) posited that learning involves three major processes: i) Acquisition of incoming information, ii) transformation of the information into usable form and iii) examining and analyzing the fitness of the transformed information. Ngwoke further added that Bruner refuses to look at stimulus as something that is far from the learner and only able to make him emit a mechanistic response but as a thing he identifies and understands in his own way.

The implication of this theory to effective teaching and learning is on the basis that meaningful learning involves the active search for solution to problems. By this, learning becomes part and parcel of the learner as he tries to find solutions to problems. On this premise, teachers are advised to encourage students to explore alternative solutions to problems so that they can discover new relationships between events or objects. These inquiry and discovery processes can be easily aided by computer-based simulations.

A computer is a machine or device that performs processes, calculations and operations based on instructions provided by a software or hardware program. It has the ability to

accept data (input), process it and then produce outputs. It is a machine that can be used as a supplementary tool in order to achieve educational goals. It has been reported that the use of computer makes students to feel confident and helps them to discover interactions among the components of a complex system (Ramjus in Mihindo, Wachanga and Anditi (2017)). Simulations are tools that facilitate learning through representation and practice in a repeatable and focused environment (Goldsim, 2011). Computer-based simulation environment provides a platform to apply knowledge in a given situation. Cigrik and Ergul in Mihindu at al (2017) asserted that the application of computer-based simulations in teaching has led to an improved teaching quality which in turn has led to better learning outcomes.

Methodology

The main purpose of the study was to investigate the effect of computer-based simulation on NCE students' academic achievement in Educational Measurement and Evaluation in Akwa Ibom State College of Education, Afaha Nsit. Specifically, the study sought to:

1. Compare the academic achievement of NCE students taught statistics with computer-based simulation and those taught statistics using the traditional talk-chalk method.
2. Find out if there is a gender effect on the academic achievement of students taught statistics with computer-based simulation.

Research Questions

1. What is the difference in the academic achievement of NCE students taught statistics using computer-based simulation and those taught statistics using the traditional talk-chalk method?
2. What is the difference in the academic achievement of male and female NCE students taught statistics using computer-based simulation?

Hypotheses

The following hypotheses were tested at 0.05 level of significance:

1. There is no statistically significant difference in the academic achievement of NCE students taught statistics using computer-based simulation and those taught statistics using the traditional talk-chalk method.
2. Ho2: There is no statistically significant difference in the academic achievement of male and female NCE students taught statistics using computer-based simulation.

The study employed the quasi-experimental design where "the static-group pretest - posttest Design" was used. The design may be as presented in Figure I below:

Treatment group	0	x	0
Control group	0	c	0

Figure I: Static – Group pretest – posttest design

Key:

3. The first two Os represent the pretest measurement for the two groups
4. x symbolizes the experimental treatment (computer-based simulation)
5. c symbolizes a different treatment (in this case the traditional talk-chalk method)

6. The second set of two Os represents the posttest measurement for the two groups.

The population of the study was all the 907 NCE students that wrote the course; EDU 223 (Measurement and Evaluation) in 2021/2022 academic session. However, a total of 87 students took part in the study. Purposive sampling technique was used to select two schools from the five schools of the College. In this case, all the students that failed the course in the two selected schools were advised to register for a two-week tutorial in the course. It is worthy to mention here that in Akwa Ibom State College of Education, Afaha Nsit, we have five schools: School of Science, School of Arts and Social Sciences, School of Vocational Technology, School of Languages and School of Early Childhood Care and Primary Education.

The two schools purposively selected for this study were School of Arts and Social Sciences and School of Languages. They were so selected because they were the ones that performed worst in the said examination. School of Arts and Social Sciences were purposively assigned to the control group taught with the traditional talk-chalk method because they were more in number (49) while students from School of Languages (38) were assigned the treatment group taught with computer simulations. Each student's score in the course was considered the pretest score.

Two instruments were utilized in the study, these were the computer-based simulation (CBS) Module and Measurement and Evaluation Test (MET). They were developed by the researcher with help from colleagues in Computer Science Department of the College. Colleagues in the area of Measurement and Evaluation also vetted 'MET' for clarity and subject content. The reliability of 'MET' was established through test – retest method and the coefficient of equivalence was 0.95.

The CBS module was made up of four lessons taught over a period of two weeks. Before exposure to the CBS module, students were sensitized on what was required of them before being issued with the module. Different days of the week were used with each group. At the end of the two weeks, a day was fixed for the posttest. This was written by the two groups simultaneously at different venues.

Results

Mean and standard deviation were employed in answering the research questions. Analysis of covariance (ANCOVA) statistic was used to test hypothesis one while independent t-test was used to test hypothesis two. The two hypotheses were tested at 0.05 level of significance. Decisions were taken on ANCOVA and independent t-test analysis based on the following statistical rules: If F-calculated (F-cal) is less than F-critical (F-crit), Ho is accepted, but if F-calculated (F-cal) is greater than or equals to F-critical (F-crit), Ho is rejected.

Research Question 1**:** What is the difference in the academic achievements of NCE students taught statistics using computer-based simulation and those taught statistics using the traditional talk-chalk method?

Table 1: Mean Score of students' academic achievement in the two groups (Experimental and Control):

Groups	N	Pretest Mean	Posttest Mean	Mean Gain
Experimental	38	18.48	41.64	23.16
Control	49	18.28	25.08	6.80

Source: Field study (2023)

The result on table 1 shows that the pretest mean score for the experimental group was 18.48 while that of the control group was 18.28. The posttest mean score for the experimental group was 41.64, while that of the control group was 25.08. The mean gain gotten by finding the difference between the posttest mean score and the pretest mean score of the two groups indicated a gain of 23.16 for the experimental group and 6.80 for the control group. By these results, it can be seen that the experimental group did better in the posttest than the control group. This implies that students taught Statistics with computer-based simulation performed better than those taught with the traditional talk-chalk method.

Research Question 2: What is the difference in the academic achievement of male and female NCE students taught statistics using computer-based simulations?

Table 2: Descriptive statistics for the performance of male and female in the posttest of the experimental group:

Gender	N	Mean	Std. Deviation
Male	22	41.45	3.75
Female	16	41.79	3.98

The result in Table 2 above shows that the mean score of the male students was 41.45 while that of the female students was 41.79. This indicates that the students (male and female) had almost the same mean score in the posttest.

Hypothesis 1: There is no statistically significant difference in the academic achievement of NCE students taught statistics using computer-based simulation and those taught statistics using the traditional talk chalk method.

Table 3: Analysis of Covariance (ANCOVA) for scores in the posttest:

Source of Variation	Sum of squares	df	Mean square	F-cal	F-crit	P-value	Decision
Between groups	2986.26	1	2986.26	497.12	4.03	0.000	significant
Within groups	282.34	84	6.007				
Total	3268.60	85					

Furthermore, Table 3 presents the values: F-calculated = 497.12 and F-critical = 4.03 at

0.05 significant level and degrees of freedom (df) of 1 and 84. Since the F-calculated is greater than the F-critical (F-cal > F-crit), the null hypothesis is rejected. This means that there is a significant statistical difference in the academic achievement of NCE students taught statistics using computer-based simulation approach and those taught statistics using the traditional talk-chalk approach.

Hypothesis 2**:** There is no statistically significant difference in the academic achievement of male and female NCE students taught statistics using computer-based simulations.

Table 4: Summary of the t-test results of the performance of male and female NCE students in the posttest of the experimental group:

Gender	N	X	Std dev.	df	t-cal	t-cat	P-value
Male	22	41.45	3.75	36	0.212	1.714	0.834
Female	16	41.79	3.98				

From Table 4, the calculated t-value of -0.212 is less than the critical t-value of 1.714 at 36 degrees of freedom (df). Therefore, we retain the null hypothesis and conclude that there is no statistically significant difference in the academic achievement of male and female NCE students taught statistics using computer-based simulations.

Discussion

The analysis of the result of research question one shows that NCE students taught statistics with computer-based simulation approach performed better than the ones taught with the traditional talk-chalk approach. This was seen in their pretest mean scores and posttest mean scores where the experimental group had a pretest mean score of 18.48, posttest mean score of 41.64 and mean gain of 23.16. On the other hand, the control group had a pretest mean score of 18.28, posttest mean score of 25.08 and mean gain of 6.80. Also, the result of testing hypothesis one as shown on Table 3 revealed the value of F-calculated to be greater than F-critical. These indicated that the computer-based simulation approach produced a better result than the traditional talk-chalk approach. The finding is in agreement with that of Okebukola and Okoye (2013) who found out that computer simulation instructional approach yielded a better result in students' achievement than the traditional talk-chalk approach and as such should be adopted in teaching as it is activity oriented and involves practical demonstration. The present study finding also agrees with that of Ali (2014). Ali found out that computer simulation approach strengthens weaker students and help brighter ones to do more. The study also confirmed that of Omoedu, Adolphus and Agbigo (2022) who investigated the effect of computer simulation on students' Academic Achievement in Chemistry in senior secondary schools in Ahoada – East Local Government Area of Rivers State. Their findings also revealed that students taught with computer simulation approach performed better than those taught with the traditional lecture method.

The analysis of research question two revealed that the mean score of the male students was 41.45 while that of the female students was41.79. The result indicated that the students (male and female) had almost the same mean score in the posttest. Again, in

testing the hypothesis that there is no statistically significant difference in the academic achievement of male and female NCE students taught statistics using computer-based simulation, the result on Table 4 revealed that the calculated t-value of 0.212 was less than the critical t-value of 1.714. This led to the retention of null hypothesis two. The result implied no gender difference.

Archin and Offoe (2015) carried out quasi-experimental research to find out differences in Mathematics performance of students using performance assessment driven instructions at the senior high school level in Ghana National College in Cape Coast. Their result revealed that performance assessment driven instructions improved students' problem-solving abilities and showed no bias between gender.

Ajai and Imoko (2015) carried out research to assess gender differences in Mathematics achievement and retention by using problem-based Learning (PBL). The design used was the pretest-posttest quasi-experimental. At the end, the study revealed that male and female students taught algebra using PBL did not significantly differ in achievement and retention scores. They concluded that male and female students are capable of competing and collaborating in Mathematics. They added that performance is a function of orientation and not gender.

The findings of the present study, have also revealed that male and female students can do better in statistics (a mathematic related course) if taught using the computer-based simulation approach. This can be as an outcome of the interaction that goes on in such a class where learning is learner-centered and learners are guided to develop problem-solving skills.

The study is an eye opener to the Government, the College Management, lecturers of Educational Measurement and Evaluation and even the students. To the Government, it's time Information Communication Technology (ICT) Unit of Colleges of Education be stocked with enough functional computers that will support computer-based simulation teaching approach. College Management will understand their role in drawing Government's attention to the necessity of functional ICT units. Lecturers of Educational Measurement and Evaluation can also know that it's time they utilize the computer-based simulation in teaching high difficult index topics, example 'Statistics'. Students will know that they are to fully participate in class instructions and assignments to improve their achievement in the course.

Conclusion

From the study, the following conclusions were drawn:

1. Students, teachers/lecturers should enrich their knowledge in ICT by exploring the internet, attending seminars/workshops in ICT and applying gained ICT knowledge to keep pace with the new trend and to improve learning outcomes.
2. Male and female students can compete favorably in Mathematics related courses without any gender influence when taught using computer-based simulation approach.

Recommendations

1. Computer-based simulation approach should be employed in teaching students most of the subjects and topics that are not easily understood when taught using the traditional talk-chalk approach. Teachers/lecturers should not only use one approach in teaching, they should explore other approaches.
2. Male and female students should be encouraged to participate fully in class activities without any fear of disapproval by opposite sex.

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