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THE JOURNAL

The International Journal of Studies in Education (IJOSE) (formerly known as Journal of Studies in Education) is an international journal that provides a forum for communicating ideas, techniques and findings in all aspects of education. By education, we mean teaching and learning that goes on in applied natural sciences, environmental sciences, management sciences, agricultural sciences, law, medical sciences, pharmaceutical sciences, social sciences, arts/humanities, engineering and other classrooms at pre-primary, primary, secondary and tertiary levels. Thus, it becomes an avenue for educators, scholars and researchers who may be working on any of the above and other educational/classroom issues and problems to disseminate their ideas, techniques and findings. The name was changed from Journal of Studies in Education to International Journal of Studies in Education in June 2015 when the Editorial Board was about to upload the journal to internet. It was found that there is another online journal bearing the same name. This necessitated the change to this new name to avoid confusion.

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EFFECT OF E-LEARNING STRATEGY ON STUDENTS' ACHIEVEMENT IN MATHEMATICS

By

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Abstract

This study was focused to find out the effect of e-learning strategy on students' achievement in mathematics. Two research questions and two null hypotheses at 0.05 level of significant guided the study. The study employed quasi-experimental design. The area of the study was Enugu education zone. The instrument called mathematics achievement test on algebra (MATA) was developed and used for both pretest and posttest. The MATA was validated by two experts in mathematics education and one educational measurement and evaluation from Enugu State University of Science and Technology, Enugu. One hundred and sixty secondary school 11 students formed the sample used for the study. Pearson Product Moment Correlation Coefficient yielded reliability coefficient of 0.97. The analysis of co-variance (ANCOVA) was used to test the hypotheses. The findings of the study revealed that the mean achievement scores of students taught mathematics using e-learning strategy is higher than those taught mathematics using the conventional method. Based on the findings of the study, recommendations were made such as ensuring stability of power supply.

Introduction

There has been a persistent decline in students' achievement in mathematics in public examinations conducted by the West African Examination Council (WAEC) and National Examination Council (NECO) in the recent times. This ugly situation has been of concern to Mathematics educators, government and the society in general. Mathematics is one of the core subjects that are indispensable in the development of science and technology. It is one of the science subjects studied because of its utilitarian values. For instance, a housewife uses mathematics when she goes shopping; she compares prices, figures out her bills, and counts her change. A bookkeeper uses mathematics to keep track of a company's income and expenses. A machinist uses mathematics when he plans his work. He must measure and figure to know how to set his tool, so that it will cut out parts with the right size and shape and so on. Mathematics is used throughout the world as an essential tool in many fields, including natural sciences, engineering, medicine and social sciences. Ehwariente and Ogbogbo (2008), described mathematics as a precision tool by all mankind in their search for a clear understanding of the physical world which enables students to develop skills in problem solving. However, in Nigeria, like in other countries of the world, learning mathematics is compulsory for students in secondary schools. Despite this, there has been a great worry and discouraging achievement of secondary school students in mathematics in public examinations. Statistics have

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shown that students' achievement in mathematics in both internal and external examinations is consistently low and over 50% of candidates that registered for mathematics in WASSCE on yearly basis failed to obtain a credit pass (Oboto, 2001; Oluave, 2010; Abakpa and Igwe, 2003; in Attah and Okavim, 2015).

Mathematics is a world of wonder—a place where, with only a few numbers and points at our command, the most amazing formulas and geometric figures appear as out of a magician's hat. It is a tool—a servant to our needs. When we wish to know how much? how many? how large? how fast? in what direction? With what chances?—the mathematician gives us a way to find the answer. Above all, mathematics is the queen of knowledge. It has its own logic—that is, a way of thinking. By applying this way of reasoning to numbers and to space, we can come up with ideas and conclusions that only the human mind can develop which often leads us to the hidden secrets of the ways in which nature works. It follows therefore that good knowledge of mathematics could enhance students' achievement in sciences and other related courses. The Federal Republic of Nigeria (FRN, 2004) goes on to outline the specific objectives of mathematics education as to include: generating interest in students in mathematics and providing solid foundations for everyday living, to develop computational skills and foster the desire and ability to be accurate to a degree relevant to the problem at hand among others. The era of the teacher being regarded as an embodiment of knowledge is past. The world is now moving at a jet speed (global village) as a result of advances in technology. Most importantly is the fact that technology entails information and communication which may be defined as the handling and processing of information (texts, images, graphs, instructions) for use by means of electronic and communication devices such as computers, cameras, telephones, etc. (Oziji, 2003 in Oziegbe, 2015).

The use of technologies to information generation, storage, processing, retrieval, dissemination is indispensable in modern societies. Tremendous advances in Computer Technology and the evolution of the internet have led to new approaches under the term e-learning. Such a model could bring educational and instructional facilities to the door-steps of Nigerian. It is envisaged that information and Communication Technology (ICT) has changed tremendously the way the world experiences diverse components of life such as health care, education, agriculture and communication. In the area of education, many things have changed about teaching and learning. These changes include the possibility of teaching and learning from a distance, learning at a time that is convenient for the learner, accessing a variety of learning and teaching resources from the internet, and open courseware (OCW). These advancements have indeed changed the concept and face of education (Njoku, 2014). According to Njoku (2014), all institutions from primary to tertiary academies need to know that e-learning platforms are now essential elements of teaching and learning. This is true because technology has taken upper hand in the society dealings. To become relevant in the society, individuals would need early exposure to the advances in technology, and given the importance of education, it would be most appropriate for all educational institutions to integrate technology into teaching and learning.

However, the use of electronic learning (e-learning) in the teaching and learning of mathematics is becoming a contemporary issue for discussion in education policy (Thierer, 2002, in Oziegbe, 2015). The term e-learning often used interchangeable with online education is where office teaching and learning is done online with the help of internet using virtual/e-classroom. It also helps in distance education where education is given to thousands of students who for various reasons have no opportunity of being physically present in schools to receive formal lectures. In this group however, are shift workers on-the-job trainees, old adults and some physically handicapped to

mention but a few. In educational institutions where there is a website, e-mail and fax facilities, students can receive lectures at home by connecting their computers to the internet. The lecturer stays in his office and delivers lectures to his numerous students at various geographical distances (Nwosu, 2002 in Nwana, 2008). In another development Naidoo (2003) in Oziegbe, (2015) perceives e-learning as a tool for improving teaching and learning and research materials. He saw e-learning as a device that makes delivery of lesson flexible, interactive and long lasting. Owing to the foregoing, one can understand that the utilization of e-learning in teaching and learning is of great importance for preparing teachers and students to be fully involved and be productive in the world of technology transfer (Oziegbe, 2015). In addition, e-learning has been seen as influencing every aspect of scholarship, from research activities in disseminating of ideas in teaching and learning.

However, conventional method (lecture method) is based on the assumption that the teacher is a "know all" while the students are ignorant and receptive. This method of teaching is seen as being highly discouraged at the Junior Secondary School levels. Okoro (2001) asserted that lecture method does not give attention to individual differences and that there is no-in-built mechanism to measure the level of students' interest in and appreciation of the teaching. Osafehinti (2008) carried out a study to determine sex differences in Mathematics achievement by senior Secondary¹¹ students at which sexes would have interacted so well to a level that could see each other as equal in academic pursuit. He found out that males achieve significantly higher than their female counter part. Agwu (2012) in his studies on how girls in some selected Secondary Schools in Imo State behave during mathematics lessons compared to other related subjects found average girls in these schools regarding mathematics as a difficult subject when compared to others. This he attributed to be as a result of poor instructional strategies which lower stages of mathematics study. Agwagah (1993) opined that male students tend to achieve significantly higher scores in mathematics than the female counterparts. Past studies indicate that teachers treat male students and female students differently. Teachers interact with male students more than their female counterparts. This differential treatment of sex has given male students more confidence than females and consequently enhances achievement on the part of male students.

It would be of interest to find out whether this result would indicate such differential findings when exposed to e-learning strategy in our Secondary Schools in teaching mathematics. Anya and Nchor (1982) in Ozomadu (2007) attributed the fact to genetic effect- favouring males in the area of spatial ability. Also Alio and Harbor-Peters (2002) stated in their studies that gender is one of the possible factors which mediate the relationship between instructional strategy and cognitive achievement. They found significant gender effect in favour of male students. So gender effects on mathematics teaching and learning will continue to be a topical issue on student achievement on mathematics when exposed to such instructional strategy as e-learning. It is on this backdrop therefore that the researchers investigated the effect of e-learning strategy on student's achievement in mathematics.

Purpose of the Study

The general purpose of the study was to determine the effect of E-learning Strategies on Secondary School students' achievement in mathematics. Specifically, the study ascertained:

- i the effect of e-learning strategy on students achievement in mathematics;
- ii the effect of e-learning strategy on the mean achievement of male and female students in mathematics.

Research Questions

The following research questions guided the study

1. What are the mean scores and standard deviations of students taught with e-learning strategy and those with expository method with respect to achievement in mathematics?
2. What are the mean scores and standard deviation of students taught with e-learning strategy with regards to achievement in mathematics?

Research Hypothesis

The following research hypotheses at 0.05 level of significance guided the study.

1. There is no significant difference between the mean scores of students taught mathematics using e-learning and those taught using conventional method.
2. There is no significant difference between the mean scores of male and female students taught mathematics using e-learning and those taught mathematics using conventional method.

Method

This study adopted the quasi- experimental design of the pre-test, posttest non equivalent control group because there are some extraneous variables that could be controlled: hence the use of intact classes which were similar in the level of education. The study was carried out in Enugu Education zone of Enugu state which was further divided into three: Enugu East, Enugu North, and Isi-Uzor Local Government Areas. The population of the study comprised all the students in Enugu Education zone public secondary schools (information from statistical section of the post primary schools management board PPSMB, 2014/15). Three secondary schools were randomly selected for the study. The Sample population from the three schools was 160 SS II Students.

The instrument used for the data collection was Mathematics Achievement Test (MAT) developed by the researcher. This was on algebra in senior secondary II. It covered topics in linear inequalities, circle geometry, algebraic fractions and so on. The instrument was validated (face and content validity) by two experts in measurement and evaluation in Enugu State University of Science and Technology (ESUT), Agbani. The reliability co-efficient of 0.96 was found using Kuder-Richardson formula 20 (K-R20).

The researcher was able to know the extent of coverage of the topics by the class teacher on getting to the schools of study. Pretest was administered to identify the level of students. The researcher and his trained resource personnel then began actual teaching using the prepared lesson notes. They used the proper school hours to ensure proper utilization of the total periods per a week. Before then, the students' class was randomly assigned to treatment and control groups. At the end of the teaching, which lasted for five weeks, post test was administered. Data collected from the pretest and posttest Achievement scores were kept separately for the two groups and were used to answer research questions and hypothesis that guided the study. The experimental group was taught using e-learning strategy. The control group was taught using expository method. The data generated from the pretest and posttest were analyzed using analysis of covariance (ANCOVA) in relation to the research questions and hypotheses.

Results:

Research Question One:

What are the effects of e-learning strategy on students' achievement in mathematics?

Research question one was answered in calculating the mean and standard deviation of the students taught by e-learning strategy and conventional methods in the posttest. The results are as shown in table II.

Table I: Means scores and standard deviations of e-learning strategy and conventional method in the posttest

| Group | Posttest | | |
|--------------|----------|------|----|
| | Mean | SD | N |
| e-learning | 55.77 | 7.83 | 81 |
| Conventional | 29.51 | 8.57 | 79 |

Table 1 shows that e-learning group achieved a higher mean score of (55.77) than their conventional counterparts (29.51) in the posttest

Research Question Two:

What are the mean scores and standard deviation of students in mathematics taught with e-learning strategy with regards to achievement in mathematics?

Research question two was answered by calculating the mean achievement scores and standard deviation of male and female senior secondary II students in the posttest. The results are shown in table 2.

Table 2: Means scores and SDs of male and female SS II students in the posttest in Experimental Group.

| Gender | posttest | | |
|--------|----------|-------|----|
| | Mean | SD | N |
| Male | 49.24 | 12.71 | 80 |
| Female | 36.36 | 15.44 | 80 |

Table 2 shows that the mean achievement score (49.24) of males was higher than the mean achievement score (36.36) of female counterparts in the posttest. This shows differential achievement of SS II students in algebra with respect to gender.

Table 3: Analysis of Co-variance Results for students' achievement in mathematics based on teaching strategy and gender

| Sources of Variation | Sum of square | DF | Mean of square | F.cal | F. Cri | DECS |
|----------------------|---------------|-----|----------------|--------|--------|------|
| Covariates | 4816.203 | 1 | 4816.203 | 33.559 | | |
| Pretest | 4816.203 | 1 | 4816.203 | 33.559 | | |
| Main effects | 522.505 | 2 | 261.252 | 1.820 | | |
| Method | 197.978 | 1 | 187.978 | 8.310 | 3.84 | S |
| Gender | 255.421 | 1 | 255.421 | 1.780 | 3.84 | N S |
| 2-way interactions | 1504.156 | 1 | 1504.156 | 10.481 | | |
| Method Gender | 1504.156 | 1 | 1504.156 | 10.481 | | |
| Explained | 7693.528 | 4 | 1923.382 | 13.402 | | |
| Residual | 17796.007 | 124 | 143.516 | | | |
| Total | 25489.535 | 128 | 199.137 | | | |

In table 3 above, it shows that F-calculated value (8.310) is greater than the F-critical value (3.84) at an alpha level of 0.05. Therefore the null hypothesis is rejected i.e. there is a significant difference between mean achievement scores of students taught mathematics using e-learning strategy and those taught using conventional methods. On the test of gender as demanded by hypothesis two, the summary of the result in the table 3 above revealed that the F-calculated value (1.780) is less than the F-critical value (3.84). Since the F-calculated value is less than the F-critical value, the researcher upheld the null hypothesis and concludes that there is no significant difference between the mean achievement scores of male and female students taught mathematics using the e-learning strategy and the conventional method.

Discussions and Findings:

The results in table 3 shows that there is significant difference between the mean achievement scores of students taught algebra using the e-learning strategy and those taught using conventional method. This finding is in line with the view of Naidoo (2003) in Oziegbe (2015) who opined that e-learning is a tool for improving teaching and learning and is a device that makes delivery of lesson flexible, interactive and long lasting. The findings further shows that there is no significant difference between the mean achievement scores of male and female students taught algebra using the e-learning strategy and those taught using the expository method. The finding of the study equally disagrees with the view of Osfehinti (2008) who pointed out that males achieve significantly higher than female counter part.

Recommendations

Based on the findings of this study, the following recommendations were made.

1. Mathematics teachers are enjoined to involve their students in e-learning method of instruction. This is expected to improve their comprehension and understanding of mathematics content and equally improve their performance in the subject.
2. Also curriculum developers should incorporate ICT driven strategies.
3. Seminars and workshops should be organized for practicing teachers on the use of e-learning strategy in teaching by the government and relevant agencies to enhance teachers' competences in the subject area. It is expected that e-learning has the capacity to improve students' academic achievement in mathematics
4. It is highly recommended also that there should be stability of power supply in order to ensure that class activities are not disrupted.

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