EFFECTS OFWEB-BASED PRACTICEON ACADEMIC PERFORMANCE IN COORDINATE GEOMETRYAMONG COLLEGES OF EDUCATION STUDENTSIN NORTH-WEST ZONE, NIGERIA

By

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Abstract

This study was aimed at investigating the effects ofWeb-Based Practice on students' performance in Coordinate Geometry among colleges of education mathematics in Northwest, Nigeria. In order to achieve this aim two research questions were asked two hypotheses were formulated. Seventy students were randomly selected each from two colleges of education and were assigned as experimental and control groups respectively. The two groups were pre-tested at the beginning of the experiment to ensure that they are similar. The experimental group was exposed to Khan Web-Practice in Coordinate Geometry. The instrument; KhanPracticeTest in Coordinate Geometry, was downloaded, validated by two senior lecturers in mathematics education. The reliability coefficient was calculated to be 0.80. The two groups were post tested, the results were analyzed using SPSS. Some of the findings include that; there was no significant difference between the performance of experimental group and that of the control group(P= 0.519).More so, no significant difference was found between male and female students exposed to Web-Based Practice (p=0.83). This shows thatWeb-Based Practice is gender friendly. It was recommended thatWeb-Based Practice should be incorporated in colleges of education, as additional learning strategy.

Introduction

Geometry according to Sarraco (2005) is a branch of mathematics that involves properties, measurement, and relationship of points, lines, angle surface and solid. Some of the major types of geometry include; Euclidean Geometry, projective geometry, differential geometry, and coordinate (Analytical) geometry.

Coordinate Geometry is a branch of geometry that enables one to solve geometrical problems algebraically (Odili, 2006). Coordinate Geometry has many applications in real life situations. Some of these according Mukati (2016) are Coordinates Geometry is used in describing the position of an object, location of air transport and also it is essential in learning other topics such as longitude and latitude. Coordinate Geometry is taught in Nigeria as part of General Mathematics and Further Mathematics in SeniorSecondary Schools. It is also taught as part of Advanced Mathematics in colleges of education, polytechnics and universities.

Despite the importance of Coordinate Geometry students' performance in it has not been Satisfactory, whenever students results in Coordinate Geometry is compared with their results in other courses you will find that the results in Coordinate Geometry is the poorest. Coordinate Geometry is a course that has a lot of formulae and equations, which students' needs to learn through practice, before they can assimilate. Brabeck, Jeffrey and Fry (2011) stressed that practice which involves, attention, rehearsal and repetition leads to new knowledge. Moreso, Campitelli and Gobet (2011) stated that practice is necessary if not sufficient condition for acquiring expertise.

Web-Based Practice and learning is one of the innovative ways that students canuse in practicing Coordinate Geometry and other mathematics courses. Web-Based Mathematics Education (WME) according Wang, Mikusa, Alshowarmini,Zouand Lai (2005) is an innovative combination of standard web technology that enables one to deliver class room ready lessons that are well prepared, effective, interesting as well as interoperable. WME is a computer based education system that enables one to learn anywhere, anytime provided there is network connections. WME includes Web BasedInstruction, Web BasedAssessment,Web Based Homework and WebBased Practice among others. National Council of Teachers of Mathematics (NCTM, 2011) stated that Web-Based Instruction and Practice enable the teacher to monitor students' progress, enables students to asses themselves, regulates their learning and become self-directed learners. Similarly, Esucuder and Furner (2008) asserted thatWeb-Based Practice changesstudents' attitude and increase students confidence towards mathematics. Rebova (2013) reported thatWeb-Based Practice increases students' motivation and performance in mathematics. In the same vein, Loannis (2010) listed the advantages ofWeb-Based Practice as "accessibility, adaptable, customizable, teacher support, convenience, portable, interoperable, integrated, dynamics, instant assessment and feedback".

Nguyen (2008) conducted a study to find the effects of Web-Based Practice on enhancing student learning and achievement. She found out thatWeb-Based Practice gave the students more practice, more fun, more clue, and more understanding. She further reported thatWeb-Based Practice group outperformed the traditional group. In a similar development. Geban (2008) conducted a research on learning arithmetic; in which the experimental group was exposed toWeb-Based Practice while the control group used the normal paper and pencil practice. The experiment group performed better than the control group in arithmetic operation in the posttest result. More so, Anderson, Edwards and Maloy (2010) conducted a study on teaching mathematics using Web Based tutoring system. The result showed that 70% of the students who exposed to solving problems using computers (Web-Based Practice) improved their performance from pretest to posttest. However, the writers of their work didn't find any study that was conducted on the useWeb-Based Practice on the teaching/learning of Coordinate Geometry. Therefore, the researchers wish to find out if theWeb-Based Practice could improve students' performance in Coordinate Geometry.

Literature showed thatWeb-Based Practice benefit both male and female students. Asthetner and Steinberg (2005) conducted meta-analysis of 14 empirical studies dealing with Web-Based Learning, the results they obtained showed that gender difference is insignificant. Similarly, Gercia, Moliana and Montoro (2013) investigated the existence of significance difference in web-based learning and web-based activities by male and female students of online project between two European Universities, the result showed that both male and female students performed similarly. Aremu and Efuwafe (2013) did not also obtain gender difference in gender acceptability, usability and performance when students are exposed to web-based learning.

Statement of the Problem

The poor performance of mathematics students in colleges of education is of great concern to lecturers, parents and the college authority. There is more obvious in Coordinate Geometry. Whenever the result of NCE 1 students is compared, the result of Coordinate Geometry is the poorest.

One of the reasons given by the student themselves is that, the course has a lot of formulae/equations that require a lot of practice before they can be absorbed by the students. Moreso, the students nowadays have a lot of distractions that prevents/reduces such practice. In order to tackle this problems, the researchers of this work want to find out if the use of Web-Based Practice can improve students' performance in Coordinate Geometry.

Objectives of the Study

The main objective of this study was to investigate the effects of Web-Based Practice on students' performance in Coordinate Geometry. Based on this, the following specific objectives were outline as to:

i. Investigate the effects of Web-Based Practice on NCE1 mathematics performance in Coordinate Geometry.
ii. Determine the effects of Web-Based Practice on NCE 1 male and female mathematics students' performance in Coordinate Geometry.

Research Questions

The following questions were asked in order to guide the study:

i. What is the effect ofWeb-Based Practice on NCE1 mathematics student performance in Coordinate Geometry?
ii. What is the effect ofWeb-Based Practice on male and female NCE 1 mathematics students in Coordinate Geometry?

Hypotheses

The following hypotheses were formulated based on the research questions:

i. There is no significant difference in mean academic performance of NCE 1 mathematics students that learned Coordinate Geometry through Web-Based Practice and those that learned through Paper - Pencil Practice.
ii. There is no significant difference in mean academic performance between NCE 1 male and female students that learnt Coordinate Geometry through Web-Based Practice and those that learnt through Paper - Pencil Practice.

Methodology

The research used pretest-posttest quasi experimental design involving two groups. Two colleges of education were randomly sampled out of the twelve colleges of education in the North-West, Nigeria. One was tagged experimental while the other was tagged control. The two groups were pretested, the experimental group was treated with Web-Based Practice, while the control was not given any treatment. Seventy students were used as sample for each group.

The instrument used for the Web-Based Practice were adopted from Khan Academy Analytic Geometry practice. The web-page is available at http://www.khanacademy.org/math/geometry-home/analytic-geometry-topic.khan. Khan Academy is nonprofit organization started by an Educationist called Salman Khan with thegoal of creating a set of tools that help to educate students. The organization produces lectures in form of YouTube, text, exercises, assignment and practice. The main mission of Khan academy is to provide a free ,world class education to anyone who needs it and where provided there is network connections. The academy is being run by hundreds of volunteers all who are spread all over the world. The volunteers are professional educationist whose qualification is from first degree up to the rank of Professors The Webpage used for this research is one the products of Khan Academy; gives students practice on topics such as:

distance between two straight lines, midpoint of two points, equation of straight lines, equation of a circle, etc.

The questions that served as the instruments of this study were downloaded and given to expert who validated them. Then the reliability of the questions were calculated to be 0.80 using split half method. Data were collected after the posttest and the results were as presented as follows.

Data Presentation

Research Question I: What is the difference in academic performance between NCE 1 mathematics students that learnt Coordinate Geometrythrough Web-Based Practice and those that learnt through Paper - Pencil Practice?

Table 1: **Mean and Standard deviation of Students Exposed to Web-Based Practice and Lecture Method**

Instructional Method	N	mean	S.D	Std error	Mean diff.
Web-based	70	39.6	6.3	0.76	
					-2.882
Lecture	70	42.4	18.5	4.309	

The mean performance of students taught with lecture method is higher than that of students exposed to the use of Web-Based method as indicated in the table. The mean difference was -2.828 in favour of students taught with lecture method. However, the use of Web-Based is more generalized as obtained in the standard deviation. This result cannot be conclusive until the hypothesis is tested.

Research Question 2: What is the difference in academic performance between male and female performance that learnt Coordinate Geometry through Web-Based Practice and those that learnt through Paper - Pencil Practice?

Table 2: ***Mean and Standard Deviation of Gender Exposed to Web-Based Practice Method***

Gender	N	X	Std	Mean diff.
Male	40	39.18	6.5	
				-1.092
Female	30	40.27	6.2	

Table 2 showed that female students exposed to the web-based method had slightly higher improvement than their male counter parts. The mean difference was -1.092 in favor of the female students. The observation imply that major difference in performance could not be attributed to gender. However, the test of hypothesis will enable the researchers' conclude.

Test of Hypotheses

Ho_1: There is no significant difference in mean academic performance of NCE 1 mathematics students that learned Coordinate Geometry throughWeb-Based Practice and those that learned throughPaper - Pencil Practice.

Table 3: ***Summary of t-test Between Web-based and Lecture Method***

Instructional Method	N	mean	S.D	Std error	t	Df	P
Web-based	70	39.6	6.3	0.76			
					0.64	138	0.519
Lecture	70	42.4	36.0	4.3			

The observed probability level obtained for the test is 0.519 (P>0.05) with these observation, there is no sufficient evidence to reject the null hypothesis. Therefore, the null hypothesis is retained.

Ho_2: There is no significant difference in mean academic performance between NCE 1 male and female students that learnt Coordinate Geometry throughWeb-Based Practice and those that learnt throughPaper - Pencil Practice.

Table 4***: Summary of t-test Between Male and Female Students onWeb-Based Practice***

Gender	N	X	s.d	t	Df	P
Male	40	39.18	6.2			
				0.35	38	0.837
Female	30	40.2	6.5			

Table 4 also indicated that there is no significant difference between the performance of male and female students exposed toWeb-Based Practice. Hence the null hypothesis is retained.

Discussion

The results from the Ho_1 indicated that there was no significant difference between the group exposed toWeb-Based Practice and those that were exposed to traditional paper and pencil practice. This contradicts the findings of Geban (2010), Anderson, Edwards and Maley (2010). The students in the experimental group really show appreciation and satisfaction while practice Coordinate Geometry through web. The reason of not being able to establish statistical different between the experimental group and control group could be traced to the fact that network used was weak, sometimes expletive. This led to not having adequate practice as intended, which consequently affected the performance of the students. Geban, Anderson and his colleague conducted their research in a rich technological countries where network connection is not a problem.

The second null hypothesis showed that there is no significant different between the performance of male and female students when exposed to Web-Based Practice and learning. This is in agreement with the findings of Astheiner and Steinberg (2005) who conducted a meta-analysis of 14 empirical studies dealing withWeb-Based Practice and learning, they discovered that there was no significant difference between the performance of male and female students. This results is also in line with the findings of Molina, Gercia and Mortoro (2010) who compared the students of two European universities on Web-Based Learning and Web-Based Activities, they also did not find significant difference between the performance of male and female students in Web-Based Learning and Practice. The researchers can conclude thatWeb-Based Practice and learning is gender friendly.

Conclusion

The web-based learning and practice is another method provided by technology for teacher and students to learn different subjects. The strength and accessibility of the network in many Nigerian institution could be a hurdle in effective implementation of Web-Based

Practice and learning of Coordinate Geometry in particular and mathematics in general. Even though this research does not establish empirical evidence of the effectiveness of Web-Based Practice over the traditional paper and pencil practice, the authors of this work are of the opinion thatWeb-Based Practice should be used in addition to the normal Paper and Pencil Practice.

Recommendations

Based on the findings, the researchers recommend the following:

i. Strong and accessible internet connection should be made available in all colleges of education in Nigeria to enhance Web-Based learning.

ii. Female students should be encouraged to study mathematics and sciences since they can perform as well as their male counter parts.

iii. National Commission of Colleges of Education (NCCE) should design a complementary course content that can be delivered on line to students.

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