EFFECT OF THREE MODES OF MOBILE INSTRUCTIONAL PACKAGE ON ACHIEVEMENT AND GENDER OF MATHEMATICS STUDENTS IN COLLEGES OF EDUCATION, IN NORTH-CENTRAL NIGERIA

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Abstract

This study investigated the effect of three modes of mobile instructional package on achievement and gender of mathematics students in colleges of education, in North-Central Nigeria. The study adopted pre-test post-test randomized experimental design. The target population for the study was all the NCE one mathematics students in North-Central Nigeria. Multi-stage sampling was used to sample the schools and students for the study. A random sample of 120 students (75 male and 45 female) were selected from three randomly selected colleges of education, in North-Central Nigeria. The research was guided by three research question and three null hypotheses and tested at 0.05 level of significant. The researchers developed mathematics mobile instructional package MMIP on mathematical concepts on trigonometry, which was used as treatment for experimental groups. A pilot study was carried out to test the research instrument. A reliability coefficient of 0.85 was obtained using the split-half method. Thirty (30) multiple choice item multiple choice questions were administered to both groups before and after the treatment. Mean and standard deviation were used to answer the research questions while analysis of covariance (ANCOVA) was used to test the research hypotheses. The findings of the study revealed that there was no significant difference in the achievements and gender of mathematics student taught using Video Only, Audio+Text and Text Only. The study recommends that lecturers should be encouraged to use Mathematics Mobile Instructional Package (MMIP) for teaching and learning of mathematics.

Keyword: Mathematics Mobile Instructional Package (MMIP), Video only (VO), Audio with Text (A+T), Text only (TO), Achievement.

Introduction

Mathematics can be seen in all facets of life and in day to day occupations such as internet technology, banking, medicine, scientific discoveries and even in our planning of daily activities (Anyanwu, Gambari & Ezenwa, 2014). Mathematics remains core subject in both primary and secondary schools, Federal Republic of Nigeria (FRN, 2009). Credits pass in mathematics and English language at senior secondary school level determined students' success and access to University education in Nigeria. Therefore there is need to integrate mobile instructional package is essential to improve students' performance in mathematics. Mobile learning is convenient in the sense that it is accessible from virtually anywhere, sharing is almost instantaneous among everyone using the same content, which leads to the reception of instant feedback and tips, this highly active process has proven to increase examination scores from the fiftieth to the seventieth percentile, and cut the dropout rate in technical fields by twenty two percent (Saylor, 2012).

Mobile-learning is defined as "learning across multiple contexts, through social and content interactions, using personal electronic devices (Cromton & Burke, 2013). Also a form of distance education, mobile learning focuses on the mobility of the learner, interacting with portable technologies, using mobile tools for creating learning aids and materials becomes an important part of learning (Trentin & Repetto, 2013). Mobile learning also brings strong portability by replacing books and notes with small devices, filled with tailored learning contents and

mobile phone (through text SMS notices) can be used especially for distance education or with students whose courses require them to be highly mobile and in particular to communicate information regarding availability of assignment results, venue changes and cancellations of lecture. It can also be of value to business people, for example, sales representatives who do not wish to waste time away from their busy schedules to attend formal educational training events. Prensky, (2001) suggests in his research titled, "Digital natives, digital immigrants" that "our students today are all 'native speakers' of the digital language of computers, video games and the Internet." University students frequently adopt new instructional technologies in learning and constructing knowledge. They use computers, video games, digital music players, video cams, cell phones, mobiles devices and variety of other devices and tools of the digital age.

The transmission of general information through the use of mobile technologies is more and more frequent at Universities and all higher educational institutions (Trentin & Repetto 2013). This information is related to event registration, dates of exams, messages sent by teachers or among students, and so on. For this reason, mobile learning, also called m-learning, is a new learning device in educational technology. It is a new generation of distance learning focusing on the use of mobile devices, mobile learning is a learning technology that uses variety of learning approaches and methods across multiple contexts and social interactions with personal electronic devices (Crompton & Burke 2013). Kukulska-Hulme, (2007) suggest that mobile devices used in distance learning are more suitable for formal learning and are also suitable for authentic and personalized mobile learning. Mobile learning technologies use a variety of mobile devices, such as Mp3 players, notebooks, mobile phones, iPads, iPods, iPhones, tablets, and so on. These mobile devices provide mobility and interactivity for students and teachers, focuses on how society, universities and institutions can support an increasingly mobile population and gives online instructor more mobility and interactivity to online students. Mobile Technologies bridges pedagogically designed learning context allowing learning to be situated in a real-world context and make students to have higher performance in mathematics (Cochrone, 2010).

Oludipe, (2012) investigated gender difference in Nigerian junior secondary students' academic achievement in basic science. Findings of his study revealed that there was no significant difference in academic achievement of male and female students at the pretest, post-test. Shaibu, Mike, Solomon, & Jarkko (2016) Investigated research on impact of mobile devices for learning in higher education institutions: Nigerian universities case study. The statistical analyses result show that there is no significant difference in the students" use of mobile devices based on gender. Atovigba, (2012) identified gender trends in Nigerian secondary students' achievement in Algebra. It was revealed that the male students performed significantly higher than the female students. Achebe (2005) conducted a study on the effect of videotape instructional package on students' achievement and retention of concepts in food and nutrition in secondary schools in Minna, Niger State. Finding s revealed that there was no gender difference in achievement and retention of students taught with videotape instructional package. Uche and Ugwu (2007) examined the effects of text and audio-taped instruction on students' achievement in secondary school biology in Igbo-Etiti Local Government Area of Enugu State. It was discovered that males did better than females when taught with video-tape while females performed higher than males when exposed to audio-tape. Gambari., Falode and Adegbenro (2014) carried out the study on investigated the effectiveness of computer animation and geometry instructional model on mathematics achievement and retention on junior secondary school students in Minna, Nigeria. However, there was no significant difference reported in the post-test performance scores of male and female students taught geometry using computer animation and instructional model.

Aim and Objectives of the Study

The aim of this research is to investigate the effects of three modes of mobile instructional package on gender of mathematics students in colleges of education, in North-Central Nigeria

. The specific objectives are to:

1. Examine the effects of mathematics Video Only Mobile Instructional Package (VOMMIP) on achievement of male and female mathematics students.
2. Examine the effects of Audio + Text Mathematics Mobile Instructional Package (A+TMMIP on achievement of male and female mathematics students.
3. Examine the effects of Text Only Mathematics Mobile Instructional Package (TOMMIP) on achievement of male and female mathematics students.

Research Questions

The following research questions were raised to guide the study:

1. What is the mean achievement score of male and female students taught mathematics mobile instructional package with Video Only?
2. What is the mean achievement score of male and female students taught mathematics mobile instructional package with Audio + Text?
3. What is the mean achievement score of male and female students taught mathematics mobile instructional package with Text Only?

Research Hypotheses

The following null hypotheses will be formulated and tested at 0.05 level of significance:

H_{01} There is no significant difference in the mean achievement scores of male and female students taught mathematics using Video Only Mathematics Mobile Instructional Package (TOMMIP).

H_{02} There is no significant difference in the mean achievement scores of male and female students taught mathematics using Audio + Text Mathematics Mobile Instructional Package (A+TMMIP).

H_{03} There is no significant difference in the mean achievement scores of male and female students taught mathematics using Text Only Mathematics Mobile Instructional Package (TOMMIP).

Methodology

The research adopted the pre-test–post-tests randomize design. The population of the study comprises all NCE mathematics students in North Central Nigeria and target population was NCE one mathematics student. 120 students were randomly selected from three colleges of education in North Central Nigeria for the study. The Instruments for the study is Trigonometry Achievement Test (TRAT) and treatment material is Mathematics Mobile Instructional Package (MMIP). The TRAT comprises of 30 multiple choice objective questions and Mathematics Mobile Instructional Package comprises of Video Only, Audio+Text and Text Only Mathematics Instructional Package. The Trigonometry Achievement Test (TRAT) and Mathematics Mobile Instructional Package (MMIP) was validated by two experts in each in mathematics education in both university and college of education, education technology experts and computer scientist; because research was carried out in colleges of education. All the experimental groups were given pretest before the treatment. Experimental group one was exposed to the use of Video only mathematics mobile instructional package '(VOMMIP)'; experimental group two was exposed to Audio+Text mathematics mobile instructional package '(A+TMMIP)'; while experimental group three was exposed to Text only mathematics mobile instructional package '(TOMMIP). The posttest was administered on the groups after six weeks of treatment. ANCOVA was used for method of data analysis. Conclusion it was established that there was no significant difference in the gender of NCE one mathematics student taught using video only, Audio+Text and Text Only Mathematics Mobile Instructional Package.

Presentation of Results

The results of the analysis of the data for this study are presented below. The analysis and result was done according to the research hypotheses:

Research Questions One: What are the mean achievement scores of male and female students taught mathematics mobile instructional package with Video Only?

Table 1:
The mean and standard deviation of pretest and posttest scores of male and female experimental group Video Only MMIP

Group	N	Pretest		Posttest		Mean Gain
		$\bar{X}$	SD	$\bar{X}$	SD	
Male	25	30.62	7.79	78.50	12.30	47.88
Female	15	27.99	6.01	75.28	15.84	47.29

Table 1 shows the mean and standard deviation of the pretest and posttest scores of male and female experimental group. From the result, it can be seen that mean score of the pretest and posttest score of the male are $\bar{X}$ = 30.62, SD = 7.79 and $\bar{X}$ = 78.50, SD 12.30. The mean gain is 47.88 in favour of the male posttest achievement score. Similarly, the mean and standard deviation of pretest and posttest score of female are $\bar{X}$ = 27.99, SD = 6.01 and $\bar{X}$ = 75.28, SD = 15.84, the mean gain is 47.29 in favour of the female posttest score. Also the result reveals the difference of 0.59 between the posttest mean gains score of male and female in favour of the male.

Research Question Two: What are the mean achievement score of male and female students taught mathematics mobile instructional package with Audio + Text?

Table 2:
The mean and standard deviation of pretest and posttest scores of male and female experimental group Audio with Text MMIP

Group	N	Pretest		Posttest		Mean Gain
		$\bar{X}$	SD	$\bar{X}$	SD	
Male	25	19.73	5.60	67.19	13.11	47.46
Female	15	25.77	5.11	69.75	11.68	43.98

Table 2 shows the mean and standard deviation of the pretest and posttest scores of male and female experimental group. From the result, it can be seen that mean score of the pretest and posttest score of the male are $\bar{X}$ = 19.73, SD = 5.60 and $\bar{X}$ = 67.19, SD 13.11. The mean gain is 47.46 in favour of the male posttest achievement score. Similarly, the mean and standard deviation of pretest and posttest score of female are $\bar{X}$ = 25.77, SD = 5.11 and $\bar{X}$ = 69.75, SD = 11.68, the mean gain is 43.98 in favour of the female posttest score. Also the result reveals the difference of 3.48 between the posttest mean gains score of male and female in favour of the male.

Research Question Three: What are the mean achievement score of male and female students taught mathematics mobile instructional package with Text Only?

Table 3: The mean and standard deviation of pretest and posttest scores of male and female experimental group Text Only MMIP

Group	N	Pretest		Posttest		Mean Gain
		$\bar{X}$	SD	$\bar{X}$	SD	
Male	25	26.68	6.47	59.06	8.89	32.38
Female	15	26.88	5.83	60.66	7.58	33.78

Table 3 shows the mean and standard deviation of the pretest and posttest scores of male and female experimental group. From the result, it can be seen that mean score of the pretest and posttest score of the male are $\bar{X}$ =26.68, SD = 6.47and $\bar{X}$ = 59.06, SD 8.89. The mean gain is 32.38 in favour of the male posttest achievement score. Similarly, the mean and standard deviation of pretest and posttest score of female are $\bar{X}$ = 26.88, SD = 5.83 and $\bar{X}$ = 60.66, SD = 7.58, the mean gain is 33.78 in favour of the female posttest score. Also the result reveals the difference of 1.4 between the posttest mean gains score of male and female in favour of the female.

H_{01}: There is no significant difference in the mean achievement scores of male and female students taught mathematics using Video Only Mathematics Mobile Instructional Package (VOMMIP).

Table 4:
ANCOVA Analysis of Achievement of Male and Female Students Scores Taught Mathematics Using Video Only Mathematics Mobile Instructional package (VOMMIP)

Sources	Sum of Squares	Df.	Mean Square	F	Sig.
Corrected Model	257.541	2	128.770	.682	.512
Intercept	10116.556	1	10116.556	53.552	.000
Covariate	160.418	1	160.418	.849	.363
Treatment	55.283	1	55.283	.293	.592
Error	6989.709	37	188.911		
Total	246240.298	40			
Corrected Total	7247.250	39			

*: Significant at 0.05

Table 4 shows the result of the hypothesis four. The hypothesis was tested using the pretest mean scores of male and female students taught using Video Only Mathematics Mobile Instructional Package as covariate for the analysis of Covariance. The F value of .293 was not significant at 0.05 alpha level that is F (1, 40) = .293, p > 0.05. The result shows that there was no significant difference in the achievement of male and female students taught mathematics using Video Only Mathematics Mobile Instructional package. On this basis, the hypothesis one is not

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rejected. This shows that there is no statistical difference in the achievements of male and female students taught with Video Only Mathematics Mobile Instructional package (VOMMIP).

H_{o2}: There is no significant difference in the mean achievement score of male and female students taught mathematics using Audio+Text Mathematics Instructional Package (A+TMMIP).

Table 5:
ANCOVA Analysis of Achievement of Male and Female Students Taught Mathematics Using (Audio + Text)

Sources	Sum of Squares	Df.	Mean Square	F	Sig.
Corrected Model	898.225	2	449.113	3.196	.052
Intercept	4870.931	1	4870.931	34.664	.000
Covariate	837.034	1	837.034	5.957	.020
Treatment	51.200	1	51.200	.364	.550
Error	5199.254	37	140.520		
Total	191903.003	40			
Corrected Total	6097.479	39			

*: Significant at 0.05

Table 5 shows the result of the hypothesis seven. The hypothesis was tested using the pre-test mean scores of male and female students taught mathematics using Video Only Mathematics Mobile Instructional Package (MMIP) as covariate for the analysis of Covariance. The F value of .364 was not significant at 0.05 alpha level that is F (1, 40) = .364, p > 0.05. The result shows that there was no significant difference in the mean achievement score of male and female students taught mathematics using Audio + Text Mathematics Mobile Instructional Package. On this basis, hypothesis two is accepted. This shows that there is no statistical difference in the achievement of male and female students taught mathematics using Audio + Text Mathematics Mobile Instructional Package.

H_{03}: There is no significant difference in the mean achievement scores of male and female students taught mathematics using Text Only Mathematics Mobile Instructional Package (TOMMIP).

Table 6:
ANCOVA Analysis of Achievements Male and Female Students Scores Taught Mathematics Using Text Only

Sources	Sum of Squares	Df.	Mean Square	F	Sig.
Corrected Model	92.880	2	46.440	.652	.527
Intercept	8432.310	1	8432.310	118.363	.000
Covariate	68.879	1	68.876	.967	.332
Treatment	25.281	1	25.281	.355	.555
Error	2635.918	37	71.241		
Total	145116.934	40			
Corrected Total	2728.798	39			

*: Significant at 0.05

Table 6 shows the result of the hypothesis two. The hypothesis was tested using the pretest mean scores of gender as covariate for the analysis of Covariance. The F value of .355 was not significant at 0.05 alpha level i.e. $F (1, 40) = .355$, p>0.05. The result shows that there was no significant difference in the achievement of male and female students taught mathematics using Text Only Mathematics Mobile Instructional Package (TOMMIP). On this basis, hypothesis three is therefore accepted. This shows that there is no statistical difference in the achievement of male and female students taught with Text Only Mathematics Mobile Instructional Package (TOMMIP).

Discussion of Results

Hypothesis One: the result of data analyzed with regards to hypothesis one reveals that there is no significant difference in the achievement of male and female students taught mathematics using Video Only Mathematics Instructional Package (VOMMIP). Both male and female performed equally. This is in agreement with the findings of (Shaibu, Mike, Solomon, & Jarkko 2016) that investigated research on impact of mobile devices for learning in higher education institutions: Nigerian universities case study. The statistical analyses result show that there is no significant difference in the students" use of mobile devices based on gender and also in agreement with the research of (Oludipe, 2012) who investigated gender difference in Nigerian junior secondary students' academic achievement in Basic Science. Findings of his study revealed that there was no significant difference in academic achievement of male and female students at the pretest, post-test.

Hypothesis Two: the result of data analyzed with regards to hypothesis two revealed that there is no significant difference in the achievements of male and female students taught mathematics using Audio+Text Mathematics Mobile Instructional Package (A+TMMIP). Both gender performed equally. This is in agreement with the research of (Gambari., Falode & Adegbenro, 2014) who carried out the study on investigated the effectiveness of computer animation and geometry instructional model on mathematics achievement and retention on junior secondary school students in Minna, Nigeria. The findings however revealed that there was no significant difference reported in the post-test performance scores of male and female students taught geometry using computer animation and instructional model. Also in contrary to the findings of (Atovigba, 2012), that find out gender trends in Nigerian

secondary students' achievement in algebra. The finding revealed that male students performed significantly higher than the female students.

Hypothesis Three: the result of data analyzed with regards to hypothesis three revealed that there is a significant difference in the achievements of male and female students taught Text Only Mathematics Instructional Package (TOMMIP). Both male and female performed equally. This is contrary to research of (Ugwu, 2007) who examined the effects of text and audio-taped instruction on students' achievement in secondary school biology in Igbo-Etiti Local Government Area of Enugu State. It was discovered that males did better than females when taught with video-tape while females performed higher than males when exposed to audio-tape.

Conclusion

1. The use of Video Only, Audio + Text and Text only Mathematics Mobile Instructional Package (VOMMIP) was effective for teaching mathematics students.
2. Video Only, Audio + Text and Text only Mathematics Mobile Instructional Package can improve students' achievement irrespective of gender.

Recommendation

1. Mathematics Mobile Instructional Package (MMIP) should be encouraged in schools for teaching mathematics.
2. Teachers should be trained on the use of Mathematics Mobile Instructional Package (MMIP) presentation that can bring better results in teaching and learning of Mathematics.

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