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EFFECTS OF INTEGRATION OF MOBILE TECHNOLOGY TEACHING STRATEGY ON THE INTEREST OF MALE AND FEMALE STUDENTS IN SENIOR SECONDARY MATHEMATICS IN NIGER STATE, NIGERIA

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ABSTRACT

The purpose of this study was to investigate the effects of integration of mobile technology teaching strategy on the interest of male and female students in mathematics in Lapai Local Government Area of Niger State. The study adopted a pretest posttest control group, quasi-experimental design comprising two groups made up of experimental group and control group. The sample of the study consisted of 300 Senior Secondary Two (SS2) students drawn from two co-educational schools in the Local Government Area. There were 155 students in the experimental group and 145 students in the control group. The experimental group was taught mathematics topics with mobile technology integration teaching strategy and the control group was taught the same topics with conventional teaching method. The instrument used for data collection was a Mathematics Interest Inventory (MII) with reliability index of 0.70. Data were analyzed using mean and standard deviation to answer the research questions and ANCOVA statistical tool to test the hypotheses at 0.05 level of significance. Findings revealed that there was a significant difference in the interest scores of students taught mathematics with integration of mobile technology teaching strategy (experimental group) and their counterpart taught with conventional teaching method (control group) in favour of the experimental group. It also revealed that there was no significant difference in the interest scores of male and female students taught mathematics with integration of mobile technology teaching strategy. Based on the findings, recommendations were made on the need to be integrate use mobile technology in the teaching and learning of mathematics.

Keywords: *Teaching Strategy, Mobile Technology, Students Interest and Integration.*

INTRODUCTION

Mathematics is a very important subject because of the vital role it has continued to play in the development of both the nation and the individual. It is a fundamental science that is needed for the understanding of most fields in science and technology. Due to the importance of mathematics, the National Policy on Education (FRN, 2004), made it a compulsory subject to be offered by every student from primary to secondary level of education. Mathematics is a necessary tool needed to be able to function effectively in the present technological age. According to Anaduaka and Hassan (2017), mathematics is an intellectually stimulating subject that features in all aspects of human activities such as politics, economics, science and technology. Technology plays a crucial role in closing the gap and bringing mathematics education to the 21st century expectations. Technology makes it possible to access the endless sea of information available from any part of the world. In today's technology savvy world, not only children, even adults feel more comfortable in using digital devices for everyday activities. It allows more mobility, motivation as well as convenience. It can change the nature of school mathematics by engaging students in more active mathematical practices such as experimenting, analyzing and reasoning, problem-solving that motivate them to rethink by giving instant feedback and rewards.

The present generation of learners considers technology as a common platform to nourish and deepen their learning so that they can comprehend what and why they are learning. Today, in most developed countries, technology is being used extensively in classrooms. The use of instructional technology in the classroom enhances learning so that students can learn more effectively. In technology implemented classes, interaction and student involvement in the learning process is fostered and learning becomes more fun and more attractive for the students and it also sustains students' interest in learning. Indeed, the interest of young people on issues related to science and mathematics is dwindling and many studies claim that there is a link between the attitude of the youth towards science and the way the contents are taught (Gallant, 2010). Gallant further stated that interest is about paying attention and enjoying some activity or content and it promotes learning because very little learning can take place without the learner being interested in the subject matter and activities. Some students can be intellectually and physically capable of learning things, but they may never learn until their interest is aroused and stimulated.

Once students are stimulated, they will continue to learn as long as the teacher is capable of sustaining their interest in the subject matter. Harbor-Peters (2001) defined interest as a subjective feeling of concentration or curiosity over something. She pointed out that interest can be expressed through simple statements made by individuals of their likes and dislikes and one is likely to do well in a discipline of interest. Interest can be seen also as a matter of attention because once there is direct interest, attention is guaranteed and learning is assured. Indeed, mobile technology especially phones have been accompanied by a growing interest in the educational benefits and applications they offer (Botha, Cronje, & Ford, 2012). A Survey of mobile learning in mathematics showed that there is a growing interest in mobile technology effectiveness, with 75% of 48 studies reporting positive learning outcomes (Crompton & Burke, 2015).

The level of students' interest in mathematics is related to their performance in the subject and if students lack interest in the subject, their performance may be poor in it. In Nigerian universities, 60% of the admissions are reserved for science-oriented candidates yearly. These vacancies are hardly filled up in some universities because of poor performance of students in mathematics and science subjects. In order to improve students' performance, different and various learning styles are often explored in various learning opportunities which can address the complexity of learners in the classroom, to capture students' interest and purpose. Learning occurs with the utilization of various resources and utilization of resources is the ability of a person to adapt to any new ideas (Lujan & DiCarlo, 2006). Increase in learning happens when the student is enjoying the process (Miller, 2001). The guarantee for learning is the creation of interest, joy, excitement and love for learning which may be achieved through the integration of mobile technology in the classroom.

Integrating mobile technology in the classroom is believed to support the educational environment or support learning. Mobile technology integration is an approach to teaching which advocates teaching concepts with mobile technology. Mobile technology is a device that is portable and it has internet access. This device includes tablet, smart phone and others. In many studies, mobile technology learning in mathematics have shown a positive effect on students' performance (Sung, Chang & Liu, 2016). Pollara and Broussard (2011) noted that the majority of studies on mobile

learning reported positive students' perception of mobile technology use in the classroom. This finding is consistent with other mobile learning studies on mathematics where in a mathematics test, there was also no significant gender difference found in the gain scores of either the experimental or control group (Tsuei, Chou & Chen. 2013; Deater-Deckard, El-Mallah, Chang, Evans & Norton. 2014). This suggests that mobile learning intervention is effective for both boys and girls but so does the traditional model followed by the control group.

This study therefore sought to find out the effects of integration of mobile technology teaching strategy on the interest of male and female students in senior secondary mathematics.

Purpose of the Study

The main purpose of this study was to determine the effects of integration of mobile technology teaching strategy on the interest of male and female students in senior secondary mathematics. Specifically, the study sought to determine the:

1. Difference between the mean interest scores of students taught mathematics using integration of mobile technology teaching strategy and those taught using conventional method.
2. Difference between the mean interest scores of male and female students taught mathematics using integration of mobile technology teaching strategy.

Research Questions

The following research questions guided the study:

1. What is the difference in the mean interest scores of students taught mathematics using integration of mobile technology teaching strategy and those taught using conventional method?
2. What is the difference in the mean interest scores of male and female students taught mathematics using integration of mobile technology teaching strategy?

Hypotheses

The following null hypotheses were tested at 0.05 confidence level:

Ho_1: There is no significant difference in the mean interest scores of students taught mathematics using integration of mobile technology teaching strategy and those taught using conventional method.

Ho_2: There is no significant difference in the mean interest scores of male and female students taught mathematics using integration of mobile technology teaching strategy.

METHODOLOGY

The quasi-experimental pretest posttest control group design was adopted for the study. The experimental group was exposed to integration of mobile technology teaching strategy while the control group was taught with the conventional method. The sample of this study comprised 300 Senior Secondary Two (SS2) students drawn from two schools that were purposively selected out of 19 senior secondary schools in Lapai Local Government Area of Niger State. Four intact Senior Secondary Two (SS2) classes (two from each school) were randomly sampled for the study from the two selected schools. Two classes in each school were through balloting assigned to experimental group, with a total of 90 male and 65 female students and the other two classes from the second school to control group with a total of 83 male students and 62 female students. There were, therefore, 155 students in the experimental group and 145 students in the control group, giving a total of 300 students that were involved in the study.

A Mathematics Interest Inventory (MII) was used for data collection. The MII consisted of 20 items and was designed to help students express their feelings towards mathematics. The instrument was validated by three experts and its index of reliability was found to be 0.75 using Cronbach Alpha statistics. Before the experiment, the school authority of the experimental group asked the students to come along with their mobile phones just for the purpose of the study and for the period of the experiment only. The experimental group was taught with integration of mobile technology teaching strategy while the control group was taught with the conventional teaching method. Both groups were taught by the mathematics teachers of the respective schools who were trained for a period of two weeks on how to strictly follow the lesson plan. Teaching of both the experimental and the control groups for the study lasted for a term. Thereafter, the Mathematics Interest Inventory (MII) was administered to the two groups. Mean and standard deviation statistics were used to answer the research questions while the Analysis of co-variance (ANCOVA) was used to test the two hypotheses at 0.05 level of significance.

Results

Answering of Research Questions

Research question 1:

What is the difference in the mean interest scores of students taught mathematics with integration of mobile technology teaching strategy and those taught with conventional method?

Table 1: Mean and Standard Deviation of Experimental and Control Groups in the Post test in the Mathematics Interest Inventory

Group	N	Mean	SD
Experimental	155	39.90	7.53
Control	145	27.13	4.76
Mean difference		12.77	

Table 1 shows the mean scores and standard deviation of the experimental and control groups with respect to the mathematics interest inventory. The experimental group had a higher mean score than the control group with a mean of 39.90 as against 27.13, and the result also shows that there is less variation in the scores of students in the control group with a standard deviation of 4.76. The difference in the mean interest scores of the experimental group and control group is 12.77.

Research Questions 2:

What is the difference in the mean interest scores of male and female students taught mathematics with integration of mobile technology teaching strategy?

Table 2: Mean and Standard Deviation of Male and Female Students of the Experimental Group in the Mathematics Interest Inventory

Group	Sex	N	Mean	SD
Experimental	Male	90	41.86	8.11
	Female	65	37.18	5.65
Mean difference			4.68	

Table 2 shows the mean score and standard deviation of male and female students of the experimental group with respect to the mathematics interest inventory. From the result obtained, the male students performed better than the female students with a mean of 41.86 as against the female students' 37.18, and the result also shows that there is less variation in the scores of the female students with a standard deviation of 5.65. The

difference in the mean interest scores of male and female students taught mathematics with integration of mobile technology teaching strategy is 4.68.

Testing of Hypotheses

Ho_1: There is no significant difference in the mean interest scores of students taught mathematics with integration of mobile technology teaching strategy and those taught with conventional method.

Table 3: ANCOVA Results of Interest Scores of Students taught mathematics with integration of mobile technology teaching strategy and those taught with conventional method

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected model	21389.116[a]	2	10694.558	364.085	0.000
Intercept	6650.601	1	6650.601	226.413	0.000
Pretest	0.334	1	0.334	0.011	0.915
Interest	21365.691	1	21365.691	727.373	0.000
Error	8724.014	297		29.374	
Total	332151.000	300			
Corrected Total	30113.130	299			

Sig. at $p<0.05$

Table 3 shows the ANCOVA result of interest scores of students taught mathematics with integration of mobile technology teaching strategy and those taught with conventional method. From the table, there is a significance difference between the interest scores of the experimental and control groups at 0.05 level of significance F(1, 297)= 727.373, P(000) is less than 0.05. Therefore the null hypothesis is not accepted. Thus, we can conclude that there is a statistically significant difference in the interest scores of students taught mathematics with integration of mobile technology teaching strategy (experimental group) and those taught with conventional teaching method (control group).

Ho_2: There is no significant difference in the mean interest scores of male and female students taught mathematics with integration of mobile technology teaching strategy.

Table 4: ANCOVA Results of Interest Scores of male and female Students taught mathematics with integration of mobile technology teaching strategy

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected model	31.794[a]	2	15.897	0.674	0.510
Intercept	2516.533	1	2516.533	106.919	0.000
Pretest	0.110	1	0.110	0.005	0.946
Gender	31.735	1	31.735	1.348	0.247
Error	3577.599	152	23.537		
Total	47323.000	155			
Corrected Total	3609.394	154			

Sig. at $p<0.05$

Table 4 shows the ANCOVA result of interest scores of male and female students taught mathematics with integration of mobile technology teaching strategy. From the table, there is no significance difference between the interest scores of the male and female students at 0.05 level of significance F(1,152)= 1.348, P(0.247) is greater than 0.05. Therefore the null hypothesis is accepted. Thus, we can conclude that there is no statistically significant difference in the interest scores of the male and female students taught mathematics with integration of mobile technology teaching strategy.

DISCUSSION OF THE FINDINGS

From the results presented in Table 3, it was observed that there was a significant difference in the interest scores of students taught mathematics with integration of mobile technology teaching strategy and those taught with conventional teaching method. The reason for the difference was because of the treatment that was carried out on the students that were taught using mobile technology. The findings of this study agreed with the studies carried out by Eyyam and Yaranta (2014) who investigated the impact of use of technology in mathematics lessons on achievement and attitudes of students' towards technology use in class and found positive attitude towards technology use in classroom. This study is also in agreement with the study carried out by Miller (2001) who opined that increase in learning occurs when students enjoy the process of learning. It is further in agreement with the study conducted by Crompton and Burke (2015) in their survey of mobile learning in mathematics, where they found that there was growing interest in mobile learning effectiveness. In line with the findings of this study is the study of Baek, Jung and Kim (2008) who asserted that many researchers agreed that using technology is

an efficient cognitive tool and instructional media. Baek et al. also suggested that technology can be helpful in classroom settings by encouraging inquiry, helping communication, constructing teaching products and assisting students' self-expression. On the contrary, Miller and Robertson's (2011) randomized controlled trial of mobile game-based learning found no significant difference between students who played mobile games and those who did not. Also not in agreement is the study carried out by Carr (2012) who did a random assignment between the experimental and control group and found no significant difference in the test performance between groups.

From the results presented in Table 4, it was observed that there was no significant difference in the interest scores of male and female students taught Mathematics with integration of mobile technology teaching strategy. This is because male and female students on the treatment group were taught using mobile technology. The findings agreed with the study carried out by Tsuei, Chou and Chen, (2013) which found that gender is not a contributing factor to students' evaluation of mobile learning studies in mathematics. Similarly, Deater-Deckard, El-Mallah, Chang, Evans and Norton, (2014) opined that gender is not a factor to students assessment in learning mathematics with mobile technology. However, contrary to the findings of this study Else-Quest, Hyde and Linn (2010) found that there are gender gaps in mathematics in favour of male students.

CONCLUSION

It can be concluded that from the findings of this study that students' interest in mathematics is enhanced when mobile technology is integrated in the classroom. Moreover, integration of mobile technology in the teaching of mathematics enhances the interest of male and female student equally as there was no significance difference on the interest scores of both genders.

RECOMMENDATIONS

The following recommendations were made based on the findings of the study:

1. Mobile technology should be integrated in the teaching and learning of mathematics in our secondary schools to enhance students' interest in the subject.

2. There is the need for workshop and seminars to be organized for teachers to expose all teachers to mobile technology integration teaching strategy.
3. Ministries of Education should reconsider approving the use of mobile technology for students in secondary schools as it has been found to be a great tool for enhancing students' interest in learning mathematics.

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