ASEAN Journal of Science and Engineering Education

Journal homepage: http://ejournal.upi.edu/index.php/AJSEE/

Effect of Developed Mobile Application on Undergraduates Academic Performance in Computer Science

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ABSTRACTS

This study is to investigate the effect of the Mobile Application developed on the academic performance of undergraduates in computer science at the University of Ilorin, Nigeria. Quasi-experimental design of pre-test, post-test non-randomized control group design was used to compare the performance of students who were exposed to Mobile Applications to learn Computer Science concepts and those who were taught through conventional methods. The computer science performance test (CSPT) was administered to the control and experimental groups as pretest and posttest. The sample size was chosen at random from 200 students. The instruments developed are mobile applications (DMP) and CSPT. CSPT was tested and a reliability coefficient of 0.86 was obtained using the Kuder Richardson KR-20. Two research questions and one hypothesis were formulated. The findings show that the experimental group is better than the control group with an average difference of 1.59. Male students did better than female students in the experimental group. There was no significant difference in the performance of male and female students in the two groups. This study concludes that the mobile application has a positive effect on student academic achievement. It is recommended, among other things, that University lecturers should take advantage of the potential of mobile technology applications in teaching.

ARTICLE INFO

Article History:
Submitted/Received 17 Feb 2022
First revised 08 Mar 2022
Accepted 19 Mar 2022
First available online 21 Mar 2022
Publication date 01 Dec 2022

Keyword:
Computer science performance test,
Computer science,
Effect,
Mobile application.

1. INTRODUCTION

Mobile technology has made communication and information access very convenient and timely to users from the comfort of their own homes and offices, and from wherever they are while on the move with their mobile phone or Personal Digital Assistants (PDAs). Mobile telephone subscriptions are at 3.3 billion-equivalent to half the global population. These statistics are substantial evidence that people everywhere interact with information (Archana & Yadav, 2013). Mobile technology possesses great potential in offering rich multimedia experiences and resources of a varied nature while enabling students to learn without being restricted by time or location in both formal and informal educational settings (Wong, 2013). Mobile technologies are widely accepted and understood and are now considered to be a normal part of everyday life.

Mobile Technologies are portable and handheld devices that are used in daily life activities by every human being. These mobile technologies have been integrated into educational contexts. Mobile technology is considered as a teaching and learning material both within and beyond the lecture room. Mobile technology has advanced considerably and this enabled learning to be more accessible. Mobile technologies are ubiquitous wireless devices that could enhance the capabilities of students and lecturers in an effective decision-making process. Mobile technology is a technological tool that can effectively engage the minds of digital learners in higher education. Mobile devices also called hand-held devices (such as iPads and smartphones) have become affordable and are within reach of the masses (Tabisa, 2013). Also, it provides opportunities for effective interaction between lecturers and learners wherever they are (Adedoja, 2016). The researchers have also introduced a variety of new tools that improve user-friendliness to the extent that they can even support education.

The adoption of mobile computing devices, such as cellphones, smartphones, and tablet computers, in higher education, and a great number of surveyed students believe mobile devices are meaningful to their academic success and use their devices for academic activities. It can be said that these mobile communication devices offer university students the opportunity to carry their university in their own hands (Taleb & Sohrabi, 2012). A vivid clarification of what mobile computing devices constitute has included transportable technologies, such as cellphones, and smartphones, and this may include tablet computers, and netbooks (Valk *et al.*, 2010).

The use of mobile technology in higher education learning should offer the opportunity for students being able to access information and knowledge at any spot and at any point of time from the devices that they are accustomed to "carrying everywhere with them", which they also "regard as friendly and personal" (Traxler, 2009). In one study, students were able to consider their learning styles when using mobile devices and were found to prefer mobile applications to aid learning rather than traditional means such as blackboard and chalks, textbooks, flashcards, maps, and worksheet. Mobile learning can transform pedagogy to cater to new generations of learners because it offers the opportunity to use active learning strategies and for learners to learn in their context, which will result in higher-level learning.

The use of mobile technology is now widespread among university students due to its flexibility and portability among many other uses. Students' adaptation of these technological tools has certainly deepened and encouraged a lot of research on mobile learning. It can be said then that the proliferation of mobile technology use in learning has indeed offered a plethora of opportunities to support the teaching-studying-learning processes. As attested, mobile learning opens the door for a new kind of learning known as 'here and now learning'. This type of learning takes place when learners have access to information 'anytime and

DOI: http://dx.doi.org/10.17509/xxxx.xxxx
p- ISSN 2775-6793 e- ISSN 2775-6815

anywhere to perform authentic activities in the context of their learning' (Martin & Ertzberger, 2013). The use of the new mobile and wireless technologies is huge progress in promoting mobile learning, proper utilization of these technologies depends solely on human factors. Mobile technologies, with their pervasive acceptance and powerful functionality, are inevitably changing peoples' behaviors. The use of mobile technology allows for cloud teaching where access to people, resources, and information will float freely regardless of location. Learners in different time zones and locations will be able to access tutors when needed.

Mobile technologies are easy means to maintain literacy skills and gain access to information and also facilitate distance learning (Mehdipour & Zerehkafi, 2013). Mobile technologies are more difficult to ignore than traditional desktop technologies since mobile technology now plays such an important role in our day-to-day lives for a variety of different purposes (Traxler, 2009). Mobile technologies are becoming more personal with the introduction of gesture-based interaction and affective computing. Devices can interpret gestures made by learners and respond appropriately based on the gesture. When a learner holds a mobile device, the device will read the physiological state of the learning to detect the learner's emotions.

Using mobile technology to reach students will benefit advanced levels of education by increasing enrolment and having a broader student population since students in different age groups will be able to access course materials anywhere and anytime (Lowenthal, 2010). With communication technology, learners can use mobile technology anywhere and anytime to access educational resources (Hassan *et al.,* 2012). Numerous advanced education organizations are actualizing mobile learning to provide flexibility in learning. The rapid growth of mobile devices, especially smartphones, has changed the way instructors deliver instructions and students learn class materials. Many universities initiate promoting economic transformation by working to eliminate barriers to educational attainment through incorporating new technologies to enhance the delivery of instructions and student learning outcomes. Mobile apps have been developed to be used on Smartphones, tablets, and iPods. Their earlier versions such as mobile games, calculators, have been developed and increased rapidly, and are also used by junior school students.

Numerous studies reveal that students predict a positive impact from mobile learning. That is, students think that mobile phones help them engage with relevant material and raise their confidence as learners (Mueller *et al*., 2008). Mobile applications play an important role in education, and the niche is sufficiently promising to attract the attention of many developers from all over the world. Moreover, those mobile phones and apps contain many categories having learning tools and traits, short, mid, and final exams notifications, learning videos issued by teaching staff, and others that achieve success for students' learning process. Mobile technologies offer many new benefits and challenges compared to previous technologies.

The highly portable, connected, easily concealable, and feature-rich devices provide a previously unavailable always-on, anytime-anyplace computing device with significant computational power, information gathering, and communications abilities. These attributes make mobile technology both attractive and potential liability in the classroom environment. Mobile-learning (m-learning) is the natural progression from e-learning. Another considerable element of the challenges is that even higher education institutions that are bent on adopting new technologies may be seriously constrained by not having enough of the necessary human resources as well as the financial capital to achieve their ideas.

DOI: http://dx.doi.org/10.17509/xxxx.xxxx
p- ISSN 2775-6793 e- ISSN 2775-6815

Mobile learning brought a great benefit to education through training at any time; training at any place; learner-centered content; and development of teaching and learning. Notebooks, mobile tablets, iPod touch, and iPads are very popular devices for mobile learning. Smart-phones and similar mobile devices have changed the way individuals interact with technology and with each other. Thus, this study was to investigate the effect of developed Mobile Applications on undergraduates' academic performance in computer science at the University of Ilorin, Nigeria.

Intending to increase classroom effectiveness, teachers aim to enhance student engagement by making student experience more independent and personalized, a growing number of higher institutes are in the phase of adoption of Mobile learning in developing countries including Nigeria. The mobile application can be used as a blended learning tool to elevate classroom productivity. The use of mobile learning applications has recorded successes in the implementation of the Distance Education Program in various countries around the globe. The approach has been expanded as a real method for strengthening teaching and learning in a complex form of education.

Nigerian educational system is transiting from four-wall classroom learning to technology-aided learning, lecturers and students being the key stakeholders of all formal education, their perception towards the use of mobile technology in the teaching-learning process has a significant impact on their decision of whether to adopt it or not. The use of mobile learning spaces is an opportunity to break the boundaries of the classroom and to improve lecturers towards a good teaching profession while providing the tools and inspiration to lead change in schools. Hence, the need to investigate the effect of developed mobile applications on undergraduates' academic performance in computer science at the University of Ilorin, Nigeria.

Research questions are:

(i) What is the difference between the performance of undergraduates taught the concept of Computer Science using a developed Mobile Application and those taught using the conventional method?

(ii) What is the influence of gender on the performance of undergraduates taught the concept of Computer Science using a developed mobile application?

The research hypothesis is Ho1 (There is no significant difference in the performance of male and female undergraduates taught the concept of Computer Science using a developed Mobile Application and those taught with the conventional method).

2. METHODS

This study employs a quantitative research method. Quasi-experimental design of pre-test, post-test non-randomized control group design was used to compare the performance of undergraduates who were exposed to the developed Mobile Application for learning concept of Computer Science and those that were exposed to the conventional method. Students' performance test on Computer Science was administered on both the control and experimental groups as pretest and posttest. The Experimental Group was subjected to a treatment using a developed Mobile Application while the Control Group was taught with the conventional method.

The population of this study was all undergraduates in Ilorin, Nigeria. The target population was Computer Science Undergraduates in the Faculty of Communication and Information Science University of Ilorin, Nigeria. 200level Computer Science undergraduates at the University of Ilorin were randomly selected for this study. The class was divided into two which consisted of the experimental and control group. 60 students were involved in this

DOI: http://dx.doi.org/10.17509/xxxx.xxxx
p- ISSN 2775-6793 e- ISSN 2775-6815

study, (12 males and 20 females) participated in the experimental group and (11 males and 17 females) participated in the control group.

The instruments were developed mobile applications (DMP) and Computer Science Performance tests (CSPT). CSPT was subjected to pilot testing and a reliability coefficient of 0.86 was obtained using the Kuder Richardson KR-20. The CSPT was administered to both the control and experimental groups as pretest and posttest. The distribution of samples along the variables is as shown in **Table 1**.

Table 1 shows the distribution of the sample for the study. The two groups comprised 60 undergraduates that were selected as samples for this study. Out of which 32 were exposed to the concept of computer science through a developed Mobile Application (Experimental group) while 28 of them were taught the same concept through conventional method (Control group).

Table 1. Distribution of sample for the study.

S/No	Sample	Gender		Total
		Male	Female	
1	Experimental group	12	20	32
2	Control group	11	17	28
	Total	**23**	**37**	**60**

3. RESULTS AND DISCUSSION

3.1. Research Question One: What is the difference between the performance of undergraduates taught the concept of Computer Science using a developed Mobile Application and those taught using the conventional method?

Table 2 shows that there was an improvement in the post-test scores of the two groups but the experimental group had a higher mean score. Undergraduates exposed to the conventional method had a mean score of 12.79 while undergraduates taught the concept of Computer Science with the developed Mobile Application had a mean score of 14.38. This implies that there was a difference in the performance of the two groups where the experimental group performed better than the control group with a mean difference of 1.59.

Table 2. Mean performance score of the experimental and control group.

Groups Gain source	N	Pre-test Mean	Post-test Mean
Experimental Group	32	6.63	14.38
Control group	28	4.14	12.79

3.2. Research Question Two: What is the influence of gender on the academic performance of undergraduates taught the concept of Computer Science using a developed mobile application?

Table 3, indicated both male and female undergraduates taught the concept of Computer Science through the developed Mobile Application had a mean score of 15.00 (Male) and 14.00 for (Female). This implies that the male undergraduates perform better than their female counterparts when taught the concept of Computer Science through the developed Mobile Application.

DOI: http://dx.doi.org/10.17509/xxxx.xxxx
p- ISSN 2775-6793 e- ISSN 2775-6815

Table 3. Influence of gender on the academic performance of undergraduates taught concept of computer science using a developed mobile application.

	Gender	N	Mean	Std. Deviation
Experimental	Male	12	15.00	.86
	Female	20	14.00	.53

3.3. Hypothesis One: There is no significant difference in the performance of male and female undergraduates taught the concept of Computer Science using a developed Mobile Application and those taught with the conventional method.

From **Table 4**, it can be deduced that there is no significant difference between male and female undergraduates' performance in the concept of Computer Science when taught using a developed Mobile Application. This is reflected in the result: t (1.5) = .128, p= 0.05. Therefore p < .128. Thus, the stated null hypothesis was established thus: There was no significant difference in the performance of male and female undergraduates taught the concept of Computer Science using a developed Mobile Application and those taught with the conventional method.

Table 4. *t*-Test of academic performance of male and female undergraduates taught concept of computer science using a developed mobile application and those taught with conventional method.

Gender	N	X	SD	Df	T	Sig	Remarks
Male	23	14.3	2.56	58	1.5	.128	Not rejected
Female	37	13.2	2.43				

The Mobile Application was developed by the researchers and validated by Educational technology experts to ensure its suitability and it was also validated by two experts in the Department of Computer Science to ensure the functionality of the Mobile Application. Undergraduates exposed to the conventional method had a mean score of 12.79 while undergraduates taught the concept of Computer Science with the developed Mobile Application had a mean score of 14.38. This implies that there was a difference in the performance of the two groups where the experimental group performed better than the control group with a mean difference of 1.59. This indicated that the experimental group benefited from the developed Mobile Application.

Findings on the influence of gender on the academic performance of undergraduates taught the concept of Computer Science using a developed mobile application revealed that male undergraduates perform better than their female counterparts when taught the concept of Computer Science through the developed Mobile Application. The findings on the performance of students based on gender revealed no significant difference in the performance of male and female Undergraduates in both experimental and control groups. This finding is in line with the study of Ahmad, (2015) who revealed no significant difference between male and female Undergraduates based on their utilization of mobile technologies for learning. It was revealed in the study that male and female users have a 50/50 percentage of use of mobile technologies. That male and female students did not differ in their attitudes toward using mobile technologies for learning. This is probably because students have foresight for the potential of mobile technologies in enhancing various activities in their learning processes.

DOI: http://dx.doi.org/10.17509/xxxx.xxxx
p- ISSN 2775-6793 e- ISSN 2775-6815

4. CONCLUSION

Mobile Applications had a positive effect on students' academic performance, the results showed that there is a significant difference in the performance of students taught the concept of Computer Science with the use of mobile applications and those taught with the conventional method. The findings also revealed a significant difference in the performance of male and female undergraduates in the experimental group. Mobile technologies have spread among great numbers of people, especially students in tertiary institutions. The tertiary institutions are competing to implement e-learning and communication media in education since conventional classroom learning no longer meets the needs of contemporary society. The university lecturers have to take advantage of the potential applications of mobile technologies in instruction. Thus, the universities have to provide a special environment to make use of the mobile technologies in developing the lecturers' capabilities in instruction and giving them the opportunity and access to the innovations to reach a high level of excellence and originality. Applying mobile technology to instruction requires a high level of commitment from both lecturers and students; otherwise, it would neither be feasible nor effective. The rapid growth of mobile devices, especially smartphones, has changed the way instructors deliver instructions and students learn class materials. Many universities initiate promoting economic transformation by working to eliminate barriers to educational attainment through incorporating new technologies to enhance the delivery of instructions and student learning outcomes. Mobile apps have been developed to be used on Smartphones, tablets, and iPods.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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DOI: http://dx.doi.org/10.17509/xxxx.xxxx
p- ISSN 2775-6793 e- ISSN 2775-6815