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Acquisition of Literacy Skills using Mobile Handheld Devices and Science Education Students' Academic Performance in Universities in Akwa Ibom State, Nigeria.

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Abstract. This survey study examined acquisition of literacy skills through the use of handheld devices and academic performance among Science Education students in Universities in Akwa Ibom State, Nigeria. The population of this study comprised of level 200 Science Education students which was 1080 (440 male and640 female) in Universities in Akwa Ibom State. The sample consisted of one hundred and twenty (120) Science Education students drawn from two universities in the State. Two instruments used were: Acquisition of Literacy Skills using Handheld Devices Questionnaire, ALSHDQ (a =.70) and Computed Result Sheet (CRS). Three research questions guided the study. The data were analyzed using mean, frequency count, percentage, t-test and Pearson Product Moment Correlation (PPMC). The results showed that the level of acquisition of literacy skills through handheld devices among Science Education students was high (weighted mean, x =3.07); Male and female Science Education students had similar performance mean scores (t = .905)and Science Education students acquisition of literacy skills through Handheld Devices was positively related to their academic performance (r = .555). It was concluded that the level of literacy skills acquisition through handheld devices among Science Education students was high, and that there was no difference in the performance means scores of male and female Science Education students exposed to handheld devices in acquisition of literacy skills.

Keywords: Acquisition, literacy skills, handheld devices, Academic performance, and Science Education Students, Universities.

1. Introduction

Every educational strategy, devices and methods are aimed at improving the learning conditions of the learners. The learner therefore is at the center of the strategies and methods. In order to achieve this aim, appropriate instructional materials and devices should be used by the teachers to impart knowledge to the learners. The learners participate better when instructional strategies of manipulated tools are being used in instructional delivery process. One of the manipulated tools is handheld mobile device. Mobile devices as teaching tools are becoming more and more common part of the Nigeria education experience in classrooms, from preschools through graduate schools. A recent research survey found that almost all teachers own a mobile handheld device which can be used to enhance learning (Itighise, 2016). The presence and use of electronic devices in the undergraduate classroom creates strong opinions as well as confusion among instructors. Policies vary as to allowing students use mobile phones, tablets and/or laptops, and eBooks during classes. Netbooks, iPads, cell phones, iPods, e-readers and even PDAs are increasingly becoming the tools of choice for today's educators. These devices may hinder or support the learning environment, depending on course context and how classroom policies are written and managed

Nationally, two polices are identified as related to the use of mobile handheld devices in teaching and learning in Nigeria. These are the National Policy on Education (NPE) (FGN, 2012) and the National Information and Communication Technology (ICT) Policy of 2001. Part 100 (f) in section 11 of the NPE specifically requires the development and promotion of effective use of innovative materials in schools.

This obviously includes the piece of technology (mobile handheld devices) with the most diverse functionality and widest usage in every country of the globe.

Ekpo (2010) reported that "National ICT Policy of 2001 empowered the National Information Technology Development Agency (NITDA) to enter into strategic alliances and to collaborate with the private sector for the purpose of realizing the nation's vision of making Nigeria an IT capable country in Africa". The IT Policy objectives include the requirement to "integrate ICT into the mainstream of education and training". The provisions of the two national policies cited above provide the policy framework for the incorporation of mobile learning into Nigeria educational systems. Mobile learning technologies offer teachers and students a more flexible approach to learnings (*Wylie, 2017).* To maximize teaching effectiveness, education in the 21st century has to be active, engaging, and customized. Students must have universal access to mobile technologies that will enable critical thinking, differentiation, and problem solving.

Mobile handheld devices is defined as any small machine that can be carried easily in one's palm and provide computing as well as information storage and retrieval capabilities (Cheung and Hew, 2009). Its multi-functionality, portability and connectivity are opening doors for learning. These tiny pocket computers keep students connected to the internet, improving their academic performance in different subject areas. However, many students are oblivious to the power in their hands; the power of educational applications which is the potential for success. Mobile handheld devices usage in academic setting has pros and cons. On the one hand, it enables easy transfer of information and can act as mean of distraction for students who tend to use it for social interest such as text messages, play games and accessing Facebook. Mobile devices have introduced new avenues to enhance students learning and project options. Mobile technology is a gateway to learning tools and resources. It makes learning more personalized and create bridges over the gaps between teachers and students. Mobile learning gives users access to tons of content anywhere, anytime and open opportunity to learn at all time. Huang, Lin and Cheng (2010) posit that mobile devices when appropriately applied in teaching and learning process enhance students' academic achievement as well as students' dispositions toward learning.

On the contrary, Sung and Mayer (2013) suggest that mobile technology itself is not sufficient to the increase in students learning rather it is the method of delivery that is significant. However, Navaridas, Santiago and Tourón (2013) found that teachers perceive an increase of students' interest and activity when incorporating mobile devices. When incorporated into the learning environment, Burkhardt and Cohen (2012) found mobile devices to be an effective tool for classroom polling, which increased student's engagement and participation by forcing each student to respond to classroom questions. In the same vein, Sung and Mayer (2013) in their study found that participants using mobile devices were more satisfied by their learning activities than participants using desktop computers. Both groups reported a higher interest in studying from mobile devices. other researchers claim that classrooms with handheld computers differ fundamentally from those that have desktop computers in that users of handheld devices can interact with other computing devices as well as with each other at the same time (Lyublinskaya, 2017; Jacquemin, Smelser and Bernot, 2014; Junco, 2012).

Ravizza, Uitvlugt and Fenn (2016) stated that mobile handheld devices are increasingly being used in education and are valuable tools for teachers and students to use in secondary and higher institutions. Churchhill and churchhill (2007) defined handheld devices as the communication tools for sharing the lesson content. Therefore, it can be used as video recording device to capture episodes of lesson taught. Some students use inbuilt cameras available in mobile devices to capture digital pictures of their classroom or lesson. According to Churchhill and churchhill (2007) students used Personal Digital Assistants (PDAs), palmtops or mobile phones to create representations that demonstrate or showcase their thinking, ideas, experience and knowledge. For example students used PiCoMap, a concept mapping software to create maps with at least four nodes and four connections. The maps, were subsequently beamed to other classmates after which the student discussed similarities and differences among the various maps. With the commencement of Global System of Mobile Communications (GSM) operations in Nigeria in 2000, the Nigeria society has witnessed the fastest ever rate of penetration of technology to the remotest of towns and villages. Mobile technologies are owned by members of every class of the Nigeria society and learners in every level of education. Inyang-Abia (2009) defined Technology as a well-researched and dependable body of knowledge to respond to practical challenges in various dimensions of human existence. Technology is applied to solving problem in human society. Newby, Stephich, Lehman and Russel (2006)

explained that just as technology has been used to address practical problem in communication, medicine, sport etc, it has also been used to address practical problems involved in human learning. Inyang-Abia (2009) noted that though educational challenges and issues are numerous, they can best be addressed through the principle, practices and procedures of educational technology. Since schools are places where learners are educated, there is need for effective utilization of mobile handheld devices.

Cheung and Hew (2009) comment that mobile handheld devices differ from other mobile tools such as laptops because the latter, although portable are typically not small and light enough to fit into one's palm. Figure 1 provides a pictorial illustration of the relationship between mobile handheld devices with laptops and desktop personal computers.

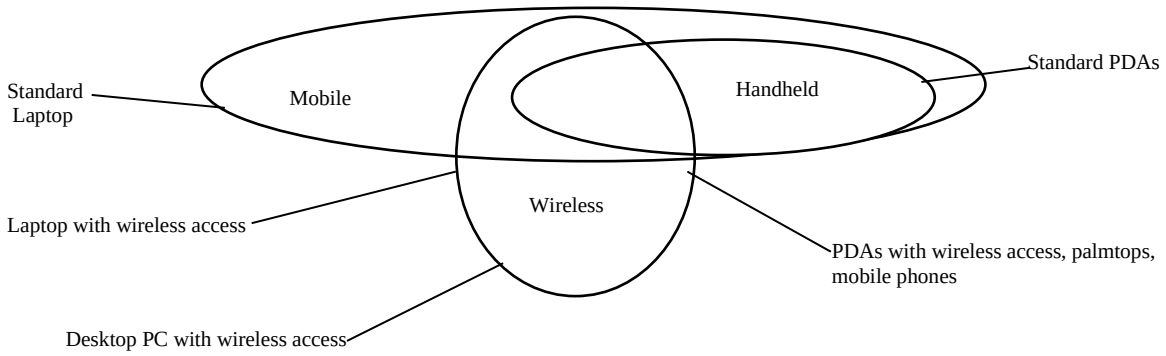

Figure 1: Relationship between Mobile Handheld Devices, Laptop and Desktop Personal Computers.
Source: Cheung and Hew (2009).

According to Cheung and Hew (2009) PDAs are shirt pocket-sized devices equipped with computer capabilities. PDAs typically come with a touch sensitive screen, a pen/stylus input interface, customizable application buttons and a multi-way navigator to browse information on the screen. Nowadays, PDAs are generally equipped with a suite of personal information management software and can connect to desktop computers and wireless local area networks using infrared Bluetooth or Wi-Fi communication technology (Lyublinskaya, 2017). Palmtops are very similar to PDAs and often they are referred to PDAs by name. The main difference however is that palmtop typically have inbuilt keyboard compared to PDAs that need a stylus for data entry.Students being "digital natives" are more engaged and motivated to learn when they use mobile devices, and research shows that academic performances can improve. Lynch(2015) reported in his study of Pew Research Center survey that 73% teachers used mobile technology in their classrooms, either through their own instruction or by allowing students to use it to complete assignments; English teachers are more likely to use mobile technology in the classroom than mathematics teachers; 47% of teachers strongly agreed, and an additional 44% somewhat agreed, that students need digital literacy courses to be successful academically and beyond.

Becta (2007) reported on the emerging model of use of mobile devices by teachers and learners to include: Teacher-directed activity; Teacher-set activity and Autonomous learning activity. In teacher-directed activity, the teacher has a very clear notion of how the device is to be used to achieve the learning objectives and also largely determines the outcome. However, within this predominantly teacher-controlled environment, learners may be enabled to exercise some degree of independence. For instance, within a lesson, learners may be allocated time to complete a specific task individually or in groups and they may use mobile devices as they feel appropriate rather than as directed.

The teacher-set activity is more open-ended in that although the teachers set the tasks and the general outcome, the processes and the format of the outcome are to a large extent defined by the learner. With this approach, learners are free to use their own ideas and their initiative. It can provide a way of engaging different learning preferences. Most learners, though not all, take the opportunity to use their mobile devices when offered the option. In Autonomous learning activity, learners are involved in a wide variety of self-directed school-based learning tasked. For instance, one child developed a way of using her PDAs to learn spellings; another used a spreadsheet to learn her multiplication tables. Other may access content not specified by the teacher, but not of curiosity and interest. Some secondary schools and universities students used mobile device

independently in lessons where there was no use planned by the teacher.

More recently, two studies that separately followed fifth and eighth graders who used tablets for learning in class and at home found that learning experiences improved across the board (Sung and Mayer, 2013). 35% of the 8th graders said that they were more interested in their teachers' lessons or activities when they used their tablet, and the students exceeded teachers' academic expectations when using the devices. With self-reporting, 54% of students say they get more involved in classes that use technology and 55% say they wish instructors used more educational games or simulations to teach lessons. Lynch (2015) comments that kids seem to respond well to the stimulus of mobile devices. They stay on task, correct mistakes in real-time and, most importantly, they get excited about learning. A research study by Olufadi (2015) on self-report and self-analysis study in two Nigeria universities with 285 students from the universities selected using convenience sampling approach revealed that, the time spent on phone calling was the only significant factor affecting students' academic performance out of seven variables including addiction and distraction.

According to a study conducted by Kuznekoff andTitsworth (2013), students who do not use mobile phone during a lecture write 60% more information in their notebooks, make more detailed notes, can recall more lecture information, score better grade and perform better in multiple choice test, than students who uses their mobile phones during the lecture. The students who do not use mobile phones provide 93% more outstanding answers to the questions in their note than the student who frequently use their mobile phone. Similarly, students not using their mobile phones can recall 87% more answers than the students using mobile phones. They described the mobile phones as a high distraction tool for the students, who instead of using it for learning get involved in texting or chatting.This study therefore examined acquisition of literacy skills through the use of handheld devices and academic performance among Science Education students in Universities in AkwaIbom State, Nigeria.

1.1 Statement of the Problem

With the advent oftechnology such as overhead projector, slide projector, visualizer, interactive whiteboard for instructional delivery in Science Education, there is continuous poor performance as observed in 2016/2017 academic session students computed results. This may be caused by inability of lecturers to use the gadgets in the teaching and learning process due to lack of operational techniques of these teaching gadgets. The questions now are: Does the use of handheld devices as instructional devices affect acquisition of literacy skills among Science Education students irrespective of their gender? Is there any relationship between Science Education students' use of handheld devices and their academic performance? To tackle these questions therefore, the study examined acquisition of literacy skills through the use of handheld devices and academic performance among Science Education students in Universities in Akwa Ibom State, Nigeria.

1.2 The Purpose of the Study

The purpose of the study was to examine the effects of mobile handheld devices on Science Education students' literacy skill acquisition and academic performance in Universities in Akwa Ibom State, Nigeria. The study was designed to achieve the following specific objectives:

- To determine the level of acquisition of literacy skills through handheld devices among Science Education students in Universities in Akwa Ibom State.
- To compare the academic performance of male and female Science Education students using handheld devices in Universities in Akwa Ibom State.
- To establish the nature of relationship between acquisition of literacy skills using handheld devices and Science Education students' academic performance in Universities in Akwa Ibom State.

1.3 Research Questions

In order to guide the researcher in the study, the following research questions were posed and answered in its course of the study:

- What is the level of acquisition of literacy skill through handheld devices among Science Education students in Universities in Akwa Ibom State?
- What is the difference in the mean performance score of male and female Science Education students using handheld devices in Universities in Akwa Ibom State?
- What is the nature of relationship between Science Education students' acquisition of literacy skills through handheld devices and their academic performance?

1.4 Methodology

The study adopted a survey research design to examine acquisition of literacy skills through the use

of handheld devices and academic performance among Science Education students in Universities in Akwa Ibom State, Nigeria. The population consisted of 1080Science Education studentsin200 levels of 2017/2018 academic session in six programmes – Biology, Chemistry, Physics, Integrated Science, Mathematics and Computer Science in the two Universities in the State .A sample of 120 Science Education students were selected from the two Universities using simple random sampling technique. Two instruments used were: Acquisition of Literacy Skills using Handheld Devices Questionnaire, (ALSHDQ) and Computed Result Sheet (CRS) for 2017/2018 session. The questionnaire consisted of 10-itemsof 4-point scale developed by the researcher. The instrument was graded strongly Agreed – 4, Agreed – 3, Disagreed – 2, and Strongly Disagreed – 1. Two experts from the Department of Science Education in the Akwa Ibom State University and University of Uyo validated the instrument. The experts, after examining the instrument, made some corrections in precision of item and ambiguity of the statement and added more questions. These corrections were effected in the final draft of the instrument. The instrument was tested for reliability using the spilt-half method with 20 subjects who were not part of the study. Their mean ratings were separated into odd and even numbered items. The two halves were correlated using the Pearson Product Moment Correlations analysis. To obtain the coefficient for the whole questionnaire, Spearmen Brown Prophecy Formula was used to get the reliability coefficient of 0.71 which was satisfactory for the study. The questionnaire was administered to the students in classes and they were instructed to complete it within 20 minutes. The data was collected between September and October, 2018. The data were analyzed using mean, frequency count, percentage, t-test and Pearson Product Moment Correlation (PPMC).

2. Result

Research Question 1: What is the level of acquisition of literacy skills through handheld devices among Science Education students in universities in Akwa Ibom State?

Table 1: Level of Acquisition of Literacy skills using Handheld Devices among Science Education Students

S/N	Acquisition of Literacy skills	SA	A	D	SD	Mean	Std. D	Decision
1	I learned problem solving skill in science through mobile phone.	61 50.8%	58 48.3%	1 0.8%	- -	3.50	.519	Agreed
2	I study science concepts well at home with mobile phone.	44 36.7%	66 55.0%	9 7.5%	1 0.8%	3.28	.635	Agreed
3	I improve my communi-cation skill in science through the use of mobile phone.	44 36.7%	47 39.2%	20 16.7%	9 7.5%	3.05	.915	Agreed
4	I use mobile device to do my assignments with ease.	44 36.7%	59 49.2%	17 14.2%	- -	3.23	.679	Agreed
5	I learned critical thinking skills through handheld devices.	44 35.8%	58 48.3%	10 8.3%	83 69.2%	3.13	.856	Agreed
6	I acquired computational skills through handheld devices.	8 6.7%	10 8.3%	19 15.8%	- -	1.53	.907	Disagreed
7	I acquired manipulative skill using handheld devices.	60 50.0%	59 49.2%	1 0.8%	7 5.8%	3.49	.519	Agreed
8	My ability to focus or pay attention improves through the use of handheld devices.	47 39.2%	35 30.0%	30 25.0%	- -	3.03	.937	Agreed
9	I solve science calculation effectively using handheld devices (ipad).	45 37.5%	57 47.5%	18 15.0%	- -	2.23	.692	Agreed
10	I increased my reading and studying skill through the use of handheld devices	56 46.7%	36 30.0%	28 23.3%	- -	3.23	807	Agreed

Weighted Mean = 3.07

Table I revealed the weighted average of 3.07 out of the maximum obtainable 5.00 which is higher than the standard average of 2.50. This means that there is high level of acquisition of literacy skills through handheld devices among Science Education students in universities in Akwa Ibom State.

Research Question 2: What is the difference in the mean performance score of male and female Science Education students using handheld devices in universities in Akwa Ibom State?

Table 2: Independent t-test of Science Education Students Academic performance by Gender

Gender	N	Mean	Std. D	Df	T
Male	53	30.32	3.847	118	.905
Female	67	30.96	3.784		

Table 2 showed that male and female Science Education students had similar performance mean scores. Female students had higher performance mean score (x = 30.96) than their male counterparts (x = 30.32) but this difference in their performance mean scores was not statistically significant (t = .905). This means that there was no difference in performance means scores of male and female Science Education students.

Research Question 3: What is the nature of relationship between Science Education students' acquisition of literacy skills through handheld devices and their academic performance?

Table 3: Pearson Product Moment Correlation of Relationship between Science Education Students' Acquisition of Literacy Skills through Handheld Devices and their Academic Performance

Variables	Mean	Std. D	N	df	R
Acquisition of Literacy Skills	29.36	2.719	120	118	.555
Academic Performance	30.68	3.890			

Table 3 indicated positive relationship between Science Education students' acquisition of literacy skills through Handheld Device and their academic performance (r = .555). This means that Science Education students' acquisition of literacy skills through handheld devices was positively related to their academic performance.

3. Discussion of Findings

Table 1 revealed that Science Education students' level of literacy skills acquisition through handheld devices was high. This supports the finding of Friedel, Bos, Lee and Smith (2013) who investigated the impact of mobile handheld digital devices on students' learning: a literature review with meta-analysis. The finding showed that mobile handheld devices successfully delivered high level meaningful skills, educational content, lessons and scaffolding. It was also supported by Burkhardt and Cohen (2012) which found mobile devices to be an effective tool for classroom polling, which increased students' engagement and participation by forcing each student to respond to classroom questions. In the same vein, Sung and Mayer (2013) in their study found that participants using mobile devices were more satisfied by their learning activities than participants using desktop computers.

Table 2 showed that there was no difference in performance mean scores of male and female Science Education students in universities in Akwa Ibom State. This study supports the early work of Okorie and Ezeh (2016) that there is no significance difference in academic performance of students and that both the male and female students performed creditably well.

Table 3 revealed that there was a positive relationship between Science Education students' acquisition of literacy skills using handheld devices and their academic performance. This results is in line with Rabiu, Muhammed, Umaru and Ahmed (2016) who found that students acquisition of skills through the use of handheld devices was positively related to their academic performance. In the same vien, findings byNavaridas, Santiago and Tourón (2013) showed that teachers perceive an increase in students'

interest and activity when incorporating mobile devices.

4. Conclusion

In this study, it was concluded that the level of literacy skills acquisition through handheld devices among Science Education students was high, and that there was no difference in the performance means scores of male and female Science Education students exposed to handheld devices in acquisition of literacy skills. It was also revealed that there was a positive relationship between Science Education students' acquisition of literacy skills through handheld devices and their academic performance.

5. Recommendations

Based on the findings of this study the following recommendations were made:

- Stakeholders in Science Education should ensure that the potentials of handheld devices such as mobile phones should be meaningfully harnessed for effective instructional delivery and students' classroom success.
- Lecturers should adopt the use of handheld devices in teaching and reduce the frequent use of conventional method.
- The use of handheld devices in teaching science concepts should be encourage by universities administrators through organization of in-house seminars and workshops for lecturers on utilization of mobile devices for effective instructional delivery process.
- Lecturers should constantly encourage Students' use of online academically through their mobile devices for effective lesson content assimilation.

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