ENHANCING GEOGRAPHY STUDENTS' ACHIEVEMENT AND RETENTION USING MOBILE DEVICES IN MINNA, NIGER STATE

BY

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2016/1/58892BT

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SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION

FEDERAL UNIVERSITY OF TECHNOLOGY

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THE PROJECT WORK SUBMITTED TO DEPARTMENT OF EDUCATIONAL TECHNOLOGY, SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION FEDERAL UNIVERSITY OF TECHNOLOGY MINNA, NIGER STATE IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF DEGREE OF BACHELOR OF TECHNOLOGY (B.TECH) IN EDUCATIONAL TECHNOLOGY

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ABSTRACT

The study investigated the enhancement of Geography Students' Achievement and Retention Using Mobile Device in Minna, Niger State. Climate was selected as the specific topic taught. Four objectives, research questions and four hypotheses were raised to guide the study. The study adapted quasi-experimental research design using pre-test, post-test, non-equivalent control group. Experimental group received experimental treatment using mobile device platform (Instagram) while controls were taught using conventional method. A simple random sampling technique were applied to select the sample of 119 students which comprises of 58 male and 61 female students. Geography Achievement Test developed by the researcher and validated by expert guide in data collection, research questions were answered using mean and standard deviation while t-test statistic at 0.05 confidence levels was used in testing null hypotheses raised from the result of findings, it was confirmed that, there is significant difference in the achievement scores of Geography students taught using mobile devices and those taught the same concept using conventional method. Subjects in the experimental group performed better than control group. The result obtained further revealed that there was a significant difference in the achievement of the male and female students when exposed to mobile devices. Based on the findings of this study, it was recommended that the use of mobile devise in schools should be encouraged by relevant bodies, and State Ministries of Education, through organizing seminars and workshops to teachers on utilization of mobile devices in teaching.

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<div align="center">**INTRODUCTION**</div>

1.1   Background to the Study

In this 21st century, the term "technology" is essential in many fields of study including education and this is because schools and other educational institutions which are supposed to prepare students to live in "a knowledge society" need to consider Information, Communication, and Technology (ICT) integration in their curriculum (Puspitawati *et al.,* 2021). Integration of ICT in education refers to the use of computer-based communication (Rachmawati, 2019). Specifically, it incorporates into daily classroom instructional process. ICT integration aims to improve and increase the quality, accessibility, and cost-efficiency of the delivery of instruction to students, it also refers to benefits from networking the learning communities to face the challenges of current globalization (Abdullah *et al.,* 2017).

The process of adoption of ICT is not a single step, but it is an ongoing and continuous step that fully supports teaching and learning and information resources. ICT integration in education generally means technology-based teaching and learning process that closely relates to the utilization of learning technologies in schools (Sarker *et al.,* 2019). Because students are familiar with technology and they will learn better within the technology-based environment, the issue of ICT integration in schools, specifically in the classroom is vital. This is because the use of technology in education contributes a lot in the pedagogical aspects in which the application of ICT will lead to effective learning with the help and supports from ICT elements and components.

Mobile learning is the use of mobile technology in learning which can effectively improve learning and teaching through the context of learning, communication, collaboration, as well as enable the students to access the contents many times (Cochrane & Narayan

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2016). Mobile learning is focused on mobile computing devices that reflect the importance of functional components for typical mobile devices which is utilized in learning (Joo *et al.,* 2016). Furthermore, Elfeky & Yakoub (2016) states that mobile learning is a powerful learning method to increase student engagement in accordance with the characteristics of the students themselves and enhance their learning experience more widely because of the quality, mobility and its supporting platform. Mobile learning can take place anytime anywhere, including conventional learning environments such as university classrooms, lecture theatres, libraries, and even canteens as well as learners' homes, community locations, parks, and in public transport. Students can have access to lecture notes and assignments by using mobile technological devices (Shonola *et al.,* 2016).

Research shows that mobile learning can increase student participation and achievement as well as help them learn. Learners do not only learn in a formal learning environment, but they can also learn throughout their lives using different tools and technologies (Filali *et al.,* 2017). Lack of mobile learning design makes learners doing unnecessary activities for instance watching movies, listening to music, playing games, chatting on social networks, and so on. These activities may lead to reduce academic performance and productivity (Odukoya *et al.,* 2017). The rapid increase in computing power, memory capacity, screen size and resolution also increases the potential of the devices. Mobile application developers may be able to take advantage of these improvements when creating new mobile applications, allowing more advanced useful applications to be utilized by mobile device users in their personal and working lives (Krawczyk *et al*., 2017). There is now potential for utilizing mobile devices for teaching and learning especially as mobile devices are very popular with young people and the current generation of students and research showing more students are owning them (Brown *et al.,* 2015). Smart phones can be used for many things including instant messaging, social media,

playing games, sending emails and general communication. As such they can now be considered essential to both personal and working lives. (Gaskin et *al.,* 2015).

Due to increasing popularity and use of social media or social network sites as well as their mobile applications in education, educators tend to use them as a source for educational purposes, since such popular social media platforms as Facebook, Instagram, Twitter, Google+, Flickr, and so on provide considerable potential for education (Hsieh, 2017; Rosell, 2018). According to a Pew Report (2018) published recently, a total of 4 billion people are active users of the internet, 53% of the total population of the world (7.593 billion), while 3.196 billion people are social media users (42% of the world population). Thus, given the huge number of active users of both the internet and social media platforms, the use of such social media platforms for educational purposes or as an educational environment allows the users to create, share and comment on a definite content (Manca & Ranieri, 2016) through a socially bounded system in which users of specific social network sites view the connections of others by creating their own profiles (Boyd & Ellison, 2008).

Social media has evolved at a rapid speed during the previous decade. Twitter, Facebook, Tik Tok, as well as Instagram, among other social media platforms, have assisted us in various ways, notably with respect to communication. In challenging situations like a pandemic, using social media to quickly disseminate information from one region to another is unavoidable. People were taken aback when a complete lockdown was declared in March 2020, for instance, and social media platforms benefited them significantly in evaluating what would operate and what would not during the lockdown. The integration of social media in education is not a new practice. Numerous instructors have included social media in the learning and teaching process. However, the use is still limited, and there is still a negative stigma in society towards social media utilization in education (Alenezi & Brinthaupt, 2022). There exist huge benefits to using social media as a learning tool such as enhance idea contribution and

commitment of students to teaching and learning (TnL) activities (Azman *et al.,* 2021), foster a sense of community (Sunar & Shaari, 2018), promote a student-centred approach (Hayes *et al.,* 2020), increase student engagement, interaction, and motivation (Solomon, 2021), encourage creativity and improve academic outcomes (Hamat & Mahlan, 2020). Educators have begun to seek classroom technologies that have the potential to help students learn actively and to improve their understanding especially in subjects that are abstract in contents such as Geography (Nor *et al.,* 2015). Geography is a subject designed to acquaint learners' knowledge of the features of the earth's crust (internal and external), the spatial spread of the physical and human features, the interactions that exist between man and these spatial features, the changes that occur over space are key concepts to be studied in Geography (WASSCE, 2017). Students commonly find abstract subjects like Geography to be abstract, requiring a depth of understanding and visualization skills (Nor *et al.,* 2015). When students have difficulties in understanding the concept well, it leads to misconceptions. Misconception among students has to be considered because it can interfere with the students' learning of scientific principles and concepts. Many researchers in particular have documented poor academic performance of students in Geography (Umar *et al.,* 2015). This has also been corroborated by high failure in public examinations in the country such as the West African Examination Council (WAEC) and National Examination Council (NECO). The need to improve students' performance in Geography has been a thing of concern to all stakeholders. This formed the foundation of this action research.

Achievement refers to knowledge and skills attained by students in a school or institution subject or course designated by a score obtain in achievement tests. Achievement describes students' success by what each student accomplishes and do occur during the implementation of the curricular strategies (Kapur, 2018). The current analysis of students' achievement in geography revealed that student's achievement has remained poor over the years in spite of

efforts to improve the learning of biology at the secondary school level (Agboghoroma & Oyovwi, 2015). Obianuju and Akuezuilo (2015) stated that Poor achievement in geography has been blamed on several factors such as ineffective instructional strategies and methods adopted by geography teachers and difficulty in understanding some basic concepts in geography. According to Akor (2017) stressed that among the features of retention that are closely associated to retention, are the power to remember (memorise) and to identify. Memory in this case, is the ability to recollect an impression of the past experiences. Akor (2017) further categorizes memory based on period in which learning took place and retrieval of learnt items.

Gender has been identified as one of the factors influencing students' performance at secondary school level (Umar et al., 2015). Reports from various academic sources have indicated that Geography as a course of study is gender sensitive (Filgona, 2016; Filgona & Sababa, 2017). This is the reason why gender issue has received the attentions of many researchers across disciplines and at different levels of education. Gender disparity in performance in Geography prevails in schools where this subject is offered (WAEC Chief Examiner's Report, 2008, 2009 in Essien, 2012). Therefore, the need for Geography teachers to seek for more effective instructional methods that are both performance-enhancing and gender-friendly is imperative.

1.2   Statement of Research Problem

Globally, smartphone use among senior secondary students has increased tremendously over years. Higher learning institutions need to develop sound strategies to leverage students' smartphone use in order to create a more autonomous learning environment. To date, numerous studies have been conducted to investigate the use of mobile devices themselves. According to Himmelsbach (2019) stated that a common theme emerged that students must collaborate to create a structured policy and plan ways mobile devices will be directly used in the classroom in order to achieve better on task behaviors and optimize the benefits mobile devices can

provide to student learning. Although there is some evidence regarding students' use of smartphones in higher education, there is little research on effective use of smartphones to support learning activities and how this elates to academic performance.

In this context, it is reasonable to question whether the benefits of cellphone usage are overcome by the harm of distraction and misuse of time, learning to academic under performance. Therefore, it is necessary to understand if students, particularly heavy cell phone users, get worse academic results when compared to those who use it in moderation. Despite the prevalent smartphone usage among senior secondary students, the extent to which this technology has contribute to their academic achievement is still inconclusive. Smartphone functions are no longer limited to only texting and calling, instead a wide array of activities needs to be considered. This research study is therefore undertaken to enhancing geography students' achievement and retention using mobile devices in Minna Niger State.

1.3   Aim and Objectives of the Study

The aim of this study is to examine enhancing geography students' achievement and retention using mobile devices in Minna, Niger State.

The specific objectives of this study are to:

1. Examine Instagram as a mobile device tool in enhancing geography students' achievement in Minna, Niger State.

2. Examine Instagram as a mobile device tool in enhancing students retention among senior secondary schools

3. Determine the influence of gender on the achievement of students taught geography using Instagram as a mobile device platform

4. Determine the influence of gender on the retention of students taught geography using Instagram as a mobile device platform

1.4   Research Questions

The following research questions are raised to guide the study

1. What is the difference in the achievement of students taught geography using Instagram a mobile device platform and those taught using traditional method?

2. What is the difference in the retention of students taught geography using Instagram a mobile device platform and those taught using traditional method?

3. What is the difference in the achievement of male and female students taught geography using Instagram a mobile device platform?

4. What is the difference in the retention of male and female students taught geography using Instagram a mobile device platform?

1.5   Research Hypotheses

The following null hypotheses were formulated and were tested at 0.05 level of significance;

1. **HO_1:**   There is no significant difference in the achievement scores of students taught geography using mobile devices and those taught using traditional method?

2. **HO_2:**   There is no significant difference in the retention scores of students taught geography using mobile devices and those taught using traditional method?

3. **HO_3:**   There is no significant difference in the achievement scores of male and female students taught geography using mobile devices

4. **HO_4:**   There is no significant difference in the retention scores of male and female students taught geography using mobile devices

1.6   Significance of the Study

At the end of this study, the study will be of significance to the following group of people, the student, teachers, parents, the school administration and curriculum planners.

The students benefit from this study as they will gain a proper knowledge on the effects of mobile phones in enhancing their academic performance. The study will give them insight knowledge on strategies in making use of their mobile devices in enhancing their academic performance.

The teachers will be able to know the effective use of mobile phones as instructional materials in teaching and learning process. By this, they will more enlightened on how to control, discipline and teach the students using mobile phones beyond normal sms, calling and social media interaction.

The parents will also benefit from knowing the importance of mobile devices in academic environment and they will be able to persuade their children in using the devices to improve in their academic performance. They will also be in support of providing them a good smartphone.

The school administration will learn the strategies of enhancing the effectiveness of mobile phones to be able to create a rule in the institution to help students use mobile phones as an instrument in their study rather than distracting tools by creating more facilities such as wireless Wi-Fi within the school premises for easy connectivity.

1.7   Scope of the Study

The research work will be conducted in some selected senior secondary school in the study area: two Senior Secondary School (SSS) students will be sampled. Geography concept to be taught is climate because of its complexity as indicated by WAEC and NECO examiners in 2017. SS two will be used for the study because the topic taught falls under their scheme of work and will not be preparing for any external examination. SS two students would be able to understand and communicate fairly in English more than SS one student. They are also familiar with geography concepts due to their year of exposure to the subjects.

1.8   Operational Definition of Terms

Academic performance: Students efforts as measured by school grades

Achievement: The array recorded from their Adeptness and abilities acquired by alms accomplishment assay to acceptance in an academy or institution.

Educational technology: is the study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technological processes and resource by students.

Mobile Device: A mobile device (or handheld computer) is a computer device small enough to hold and operate in the hand.

Mobile Learning: Mobile learning is the delivery of educational materials and learning contents through mobile technologies.

Retention: is the ability to recollect an impression of the past experiences

Smartphone: a smartphone is a portable computer device that combines mobile telephone and computing functions into one unit.

SMS: A short messaging service, is a text messaging service component of most telephone, internet and mobile device systems.

CHAPTER TWO

LITERATURE REVIEW

2.1 Conceptual Framework

2.1.1 Concept of mobile learning

The term "mobile learning (M-learning) is a tool with considerable potential that provides new possibilities for education and learning assessment (Nikou and Economides, 2017). The United Nations Educational, Scientific and Cultural Organization (UNESCO) indicated the potential of m-learning to enhance learning quality and students' test results. M-learning is a critical component of higher education, and thus its acceptance and adoption receives growing interest. However, recent studies by Hamidi and Chavoshi (2018) have indicated that although many universities have extended their online learning platforms to mobile services, students' interest and usage of m-learning is not as high as expected. Mobile technology is becoming an adoptable technology or many of the educational organisations with its dynamic scalability and usage of virtualize resources as a service in higher education through the Internet (Christina, 2017). After the revolution in the mobile devices the capabilities of delivering present massive range of e-learning materials by means of new mobile technology especially in the last two decades widely utilized mobile phones and wireless communications technologies in institutions because of the less cost, availability and accessibility of wireless connectivity (Christina, 2017).

Mobile learning has depended on the features and tools embedded with powerful mobile devices and the new wireless technologies such as mobile phones, smart phones, tablets or any other handheld devices to interface and communicate all students worldwide that will improve their learning experience anywhere and at any time. Above all this mobility enables M-learning

in formal and informal settings for individual learning and collaborative learning by multiple user (Christina, 2017).

2.1.2 Concept of geography

Geography is a popular subject among senior secondary schools in Nigeria that studies the interrelationships between the physical environment and humans in the place. Geography can be divided into two branches, physical, and human geography. The natural side studies various topics such as climatology, weather, geomorphology, topography maps, rocks, soils, natural resources (e.g. water), seas and oceans geography. The human side pertains to the social relationships (cultures, economics and politics) among peoples within the one region and the effects of the interrelationships between people and their surrounding environment. . Geography deals with population all over the world, thus it is required to be studied from near and far. The value of geography comes as a result of the changes that have happened in the world. Additionally, it is necessary to develop the knowledge and skills in geography due to the changes in the world and the great challenges faced day-to-day. Geography provides good information with well-interpreted analysis to help society understand the changes, problems, and challenges which are happening across the world. It also provides the information needed to make decisions and solve problems.

2.1.3 Technology-enhanced teaching and learning in geography

Digital technology can be used as a tool in learning and teaching geography, whether in secondary schools or higher institution. Power-point presentation have been used as an ICT tool in learning geography in secondary schools where different diagram such as maps, are displayed on the white board using projection. The results of this study suggest that it has a positive effect on teachers' and students' motivation in learning environments and especially in an effective primary geography learning environment. 'Geographical Information Systems' (GIS) has been used for teaching geography. Incekara in his introduction states that GIS is a

computer system for drawing maps, inquiring, analyzing and displaying the spatial data that is related to places in the world. GIS has the ability to display all information which is relevant to the places in several methods like charts, maps, and tables on the computer screen. Another tool is a cell phone that can be used in learning geography. (Shi *et al*., 2017) notes that a cell phone is a tool of technology which can be used by the learner to seek places and things by using Global Positioning System (GPS).Hence, students have the ability to identify their positions by using this geographic application. GIS is an effective tool to enhance learners in their geography skills and to think geographically so that they can analyze spatial data.

2.1.4   Merit of mobile technology in learning

Mobile technology has many advantages such as expected performance, reduced investments in software, hardware, and professional staff to maintain servers and upgrade software, high availability, reduced launching time, infinite scalability, tremendous fault-tolerance capability, ad accessibility, enhanced collaboration and mobility through the using of mobile devices. Moreover, M-learning increase accessibility through the ability to access learning contents on portable devices enables learning on the go using mobile devices (Dange, 2018). Mobile technology can be integrated into course design and assessment and used to integrate strategies of motivation and engagement; however, educators tend to use familiar technology to make them efficient and not necessarily effective by using it as learning currency (Adeboye, 2016; Alexander *et al.,* 2019). Increasingly, students use mobile computing devices to handle their day-to-day operations and to complete tasks they had been doing on desktops, including school assignments, registering for courses, and taking online classes, and they are described as hyper-connected, – meaning they own 10 or more of these devices (Pew, 2017). Learners from these connected households arrive on campuses with at least three of their devices and they want to use them (Torrence, 2016).

In learning process the mobile devices increase flexibility through the distribution of course materials in video, image and audio formats also podcasting has a way of providing greater flexibility to learners. Evolution of different digital technologies through numerous media has enhanced the distribution of audio and video contents over the internet. Students can subscribe to automatic downloads of new materials as it becomes available, so it can be accessed by the student in their own time and place (Christina, 2017). This availability increases the learner flexibility in accessing the learning contents. In a similar work carried out by (Criollo *et al.,* 2018) showed that students who use mobile technology devices had more motivation for learning than those who do not. Furthermore, m-learning allows learners to adapt existing mobile features to meet their needs, develop their interests, and construct their own learning (Gurung *et al.,* 2016).

According to (Hamidi *et al.,* 2018) opined that m-learning allows for actively controlling the acquisition process, this leads to an increase in learner motivation. In addition, mobile technologies foster self-directed learning, which encourages students to participate more actively in their learning process (Metafas and Politi, 2017). Web 2.0 also has a positive effect on m-learning as reported by Zehra *et al.,* (2020). "By its very nature, not only can Web 2.0 support education but has the potential to blur the boundaries between formal (planned, scheduled, structured, facilitated and class based) and informal learning environments (opportunistic, non-facilitated, non-class based and entirely learner driven) and become an integral part of the process of learning and teaching.

Fu and Hwang (2018) stated that the environments in which the study of mobile learning has been conducted have some similar features with in previous studies. These features include enhancing availability and accessibility of information networks, engaging students in learning-related activities in diverse physical locations; supporting of project-based group work, improving of communication and collaborative learning in the classroom, and enabling

quick content delivery. In higher education the mobile devices can enhance learning by increasing the use of podcast in education has the ability to positively influence the teaching and learning experiences of students (Amirul *et al.,* 2022). Many recent research projects have been focused on the effectiveness of mobile learning and majority of them have showed positive effectiveness. According to (Oyelere *et al.,* 2016) on the effectiveness of m-learning in a university showed that students prefer podcasts to their textbooks as a learning aid.

2.1.5 Demerit of mobile technology in learning

The limitations of mobile technology such as the harmful effects, the small screen size of most of the devices, there is no denying that the storage capacities of mobile devices are limited and devices may become outdated quickly (Christina, 2017). In spite of the several benefits identified above, some researchers have maintained that mobile phones have negative effects. For instance, Mamudu and Oyewo (2015) argued that the emergence of several chat engines like whatsapp, google, e-buddy and so on has made it almost impossible for some people to part with their phone such that they have become addicted to it. Such individuals sleep and wake up with the cell phone beside them. Ezemenaka (2013) also pointed out that such addiction take strong toll on the students without noticing it and some find it hard to believe that they are addicted to their phones. (Mohammadi *et al.,* 2020) talked about bad effects of smartphone use in learning like for example student's attempts to search for inappropriate content on the internet, engage in examination malpractice, and violate the privacy of instructor and colleagues. Whilst the small screen, decrease in learning concentration, inequality among students regarding the ownership and availability of smartphone services.

With regard to the barriers, Nikolopoulou (2019) mentioned that the lack of equipment and the current legislation regarding mobile technology use in school settings were the most important factors inhibiting the effective utilization of smartphones in learning. Factors like students abusive behaviour, control, noise, and distraction were bad results of smartphones for online

lessons. Iqbal & Bhatti (2020) stressed these facts claiming the smartphones use causes students' distraction, techno stress and emotional detachment; and wastes their time. Kadry & Roufayel (2017) also mention that the frustration caused by students to teachers while using their smartphones inside the classroom by texting, tweeting, and snap chatting that produce an incredible distraction and make the teaching environment very complex.

Bhutia and Tariang (2016) described a mobile phone addict as a person who constantly checks his/her phone every now and then, and the urge to check the mobile phones becomes so strong that he/she cannot stop even if he/she wishes to. Such a person is extremely attached with the mobile phone to the extent that he/she uses it while doing other things such as eating, walking, studying, and even uses it inappropriately in places like petrol stations, meetings, classrooms, mosques, churches, banks etc. He/she uncontrollably fiddles with the phone most of the time and stays on the mobile phone longer than he/she intended and repeatedly performs trivial tasks such as playing games, listening to music, watching movies. Mobile devices are prone to a lot of distractions, especially form social media notifications and pop-ups. It calls for a great deal of self-discipline which post student lack. Besides accessing learning materials could be an issue for people form areas with poor or no network coverage. Most of the information and learning materials are available online.

With increasing use of mobile devices and applications for storing or accessing personal and sensitive information, many users are not aware of the growing privacy threats in using these devices and many users are also not aware that some mobile apps are not so secure (Shonola & Joy, 2016). As more people use smartphones and tablets for their educational activities, the more attractive these devices and their applications become targets to attackers with malicious intents.

2.1.6   Goals of tertiary education with mobile technology

Several studies have investigated students' preparedness to incorporate learning with mobile devices. A study by (Yeap *et al.,* 2016) investigated that students are likely to adopt technology for learning when the use of the particular technology aligns with their learning approaches using mobile devices for learning actually empowers the students to take control of their learning pace and help them in their academic development and productivity. However, it is assumed that with the growing development in smartphones, mobile learning would be made possible as many companies are very competitive in manufacturing smartphones, incorporating up-to-date apps, sold at low prices. Subsequently, this technology can reach even low-income households.

The notion of bring your own device (BYOD) originated from the corporate sector. In 2009, the Intel Company realized that its employees used their own devices such as laptops, smartphones, tablet PCs, to connect to the corporate network resulting in productivity increase and cost savings. Since then, the BYOD approach has been gaining in popularity in the business world and branching out into other sectors such as education (Harkins, 2013). In context of education, BYOD and mobile learning are conceptually similar but each with a different focus in terms of affordance. BYOD focuses primarily on the use of a personally owned mobile device and its associated technology to facilitate personalized learning (Kong and Song, 2015). Mobile learning concerns itself mainly with the range of ubiquitous learning opportunities offered by mobile devices and wireless internet access. Ubiquitous learning is defined as "the potential of computer technology to make learning possible at any time and at any place" Yu *et al.,* (2018). Under this definition, ubiquitous learning encompasses the learning environments that enable students to access learning content without spatial and temporal limitations, but it does not necessarily require a personally owned mobile device. In teaching

and learning level, BYOD can render one-to-one learning affordable and accessible to students whose proficiency in using the devices can help them to become more independent learners.

2.1.6.1 Smartphone use in learning situation

A smartphone combines the cellphone with email and Web, music and movie player, camera, camcorder, GPS navigation, voice recorder, alarm clock, flashlight, photo album, address book and a lot more. Smartphone is the user's personal assistant that can deliver information and answer questions about almost everything (PC Magazine Encyclopedia, 2021). Thus, the enhancement in the varied functions of the smartphone has created exceptional and unlimited opportunities for both teacher and learners. Hence, it has been of a vital supportive role that supports and enriches the educational process of both teachers and learners (Kyobe and Van Bell, 2018). With the increase in the number of students of today's generation who own mobile devices and smartphones, utilization of these devices in teaching and learning has been essentials (Ferguson *et al.,* 2015).

The internet and (smart) mobile technologies are powerful and their benefits go beyond just making our work efficient. Smart mobile devices can increase the productivity and help teachers achieve greater results in teaching curricula (Adeboye, 2016). The Internet, and by default, some of its tools, i.e., Wikipedia, and social media allows readers to see the intricate nature of human knowledge and human interdependence, function as a network (Lima, 2015). Smart mobile devices allow users of various backgrounds and experiences to exchange knowledge and collaborate more in-depth and with greater breadth and faster than ever before in history (Danford, 2014). Students' achievement increase significantly when students use mobile learning devices, including smartphones, during learning time. This is because their time-on-task completion will increase as they have the device at hand.

Apart from the fact that smartphone technologies are mostly used for communication and social media purposes, they are nowadays used incontrovertibly for certain educational purposes (Wisnuwardana, 2019). Smartphones have been replacing computers, and an email application is mostly used. The smartphone is been utilized as a means for knowledge downloading, uploading, and sharing (Al Fawareh & Jusoh, 2017). Students nowadays can run effectively their study time. They can grasp updated e-books and online pre-requisite materials using different kinds of software that are popular in smartphones making learning more flexible, enjoyable and time and place efficient (Masadeh and Elfeky, 2016).

2.1.7 Enhancing technology incorporation into education

There are lots of mobile learning methods such as pedagogical approaches which include method and practices that are used to deliver and learn a curriculum. These include constructivist, collaborative, connectivist, integrative, reflective method and practices that are evidenced in activities. Krull and Duart (2017) believe that a sound pedagogical approach with an appropriate selection/use of mobile technologies has the potential to enhance learning. Teacher and learner factors (such as attitudes, beliefs, and aptitudes) are directly related to learning. Alhumaid (2019) notes that learners' learning experiences may be affected by the varying knowledge, skills, attitudes, and experiences of teachers owing to the unique characteristics of mobile devices. Criollo (2021) further explains educator issues with use of mobile devices as "difficult understanding, difficulty of use, discomfort of use, culture of rejection of change, extra workload, updating of knowledge, extra effort".

There is also integration of short message service (sms), Facebook applications have to help higher education organization cope with rapid technology change, competition, and globalization (Christina, 2017). Shohola and Joy (2014) discuss the acceptance and readiness to use mobile technology by the teachers as well as the learners as a critical factor determining the success rate of mobile learning implementation. The effectiveness of m-learning however,

faces some constraints as reported by Ozuoreun & Tabak (2012) listed the constraints in three dimensions which are human dimensions (students and instructors), the design dimension (content and technologies), and the institutional dimension (universities, colleges and schools). The human dimensions include distractions, noise, differing comfort levels, and differing visibility levels. The design dimensions include small screen size, inadequate memory, short battery life, inadequate built-in functions and the complexity of adding applications. The institutions dimensions include network speed and connectivity, content and software application limitations. Some scholars pointed out that m-learning can neither replace nor displace classroom or other learning approaches, but only complement and add value to the existing learning methods therefore, efforts should be directed at integrating m-learning with other learning methods. The integration of m-learning with classroom and e-learning is considered as a form of blended learning strategy.

Mohanna (2015) presented the possibility of integration among M-learning, software and hardware technologies to create multimedia applications capable of facilitating the interaction of educational content in various formats such as lectures, quizzes, tutorials, games, short messages, and multimedia. As an attempt to explore the use of M-learning in universities, Andrew (2017) also addressed classes of ways, including promoting on-campus interactivity through mobile devices, a student needs an inquiry, and low-cost M-learning approaches.

2.2   Theoretical Framework

2.2.1   Technology acceptance models and mobile services acceptance model

Various technology acceptance models and theories have been suggested in the literature. For an understanding of the existing work in this subject, a review of some related and underlying models are discussed below.

Several theoretical models have been developed to test the users' acceptance behavior. Among them are; the technology acceptance model (TAM) (Venkatesh and Davis, 2000), TAM is one of the most widely used models due to its understand ability and simplicity (Legris *et al.,* 2003). TAM predicts user acceptance of a technology based upon estimation of three core constructs: perceived usefulness (PU), perceived ease of use (PEOU), and behavioural intention (BI); however, the major constructs of TAM cannot fully reflect the specific influence of technological and usage-context factors that may influence users' acceptance. As a consequence, two other models have been incorporated. The first is the Extended Technology Acceptance Model (TAM2) (Venkatesh and Davis, 2000) which includes social influence process (subjective norm, voluntarism, and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, and PEOU). TAM adapts this belief attitude intention behavior relationship and further hypothesizes that two influencing factors (perceived ease of use and perceived usefulness) are the key factors leading to user acceptance of information technology (Zhao & Zhu, 2010).

The second is Unified Theory of Acceptance and use of Technology (UTAUT) (Venktesh *et al.,* 2003) the theory holds that four key constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) are direct determinants of usage intention and behavior. Gender, age, experience, and voluntary of use are posited to mediate the impact of the four key constructs on usage intention and behavior. Based on studies of eight prominent information system adoption models including TAM. Since its introduction, the UTAUT model has been applied and tested extensively for predicting system usage and making technology-adoption- and technology-usage-related decisions in various fields such as interactive whiteboards (Šumak *et al.*, 2017), near-field communication technology (Khalilzadeh *et al*., 2017), mobile health (Hoque and Sorwar, 2017), home telehealth services (Cimperman *et al.,* 2016), and acceptance of Enterprise Resource Planning (ERP) software (Chauhan and Jaiswal,

2016). Applied research regarding the UTAUT model has been extensive. Therefore, this study used the UTAUT model as the theoretical basis to evaluate the influences of technology-related factors on m-learning adoption

Subsequent validation of UTAUT in a longitudinal study found it to account for 70% of the variance in usage intention (Venktesh *et al.,* 2003). Effort expectancy has been introduced in the UTAUT model, and is a crucial predictor of technology acceptance. Effort expectancy has been introduced in the UTAUT model, and is a crucial predictor of technology acceptance. According to Venkatesh et al. (2003), EE is "the degree of ease associated with the use of the system." According to (Cimperman *et al.,* 2016), the antecedents of EE are ease of use, complexity, and PEOU. PE has also been introduced in the UTAUT model, and has been defined as "the degree to which an individual believes that the system helps to improve job performance." BI has been defined as "the degree to which a person has formulated conscious plans regarding whether to perform a specified future behavior." According to one study, (Hoque and Sorwar, 2017) PE and EE are direct determinants of BI.

2.2.2 The diffusion of innovation theory

Diffusion of Innovation (DOI) Theory, created by Rogers in 1962, is a sociology hypothesis. It originated in communication to explain how, after some time, a thought or item picks up force and diffuses (or spreads) through a particular populace or social framework. The final product of this dispersion is that individuals, as a major aspect of a social framework, acknowledge and receive another thought, conduct, or item. Nigerian schools have progressively received different sorts of mobile learning gadgets for various purposes. Appropriation implies that an individual accomplishes something uniquely in contrast to what they had recently done (i.e., buy or utilise another item, obtain and play out another conduct, and so forth.). The way to reception is that the individual must see the thought, conduct, or item

as new or imaginative. It is through this that dissemination is conceivable. (Boston University School of Public Health, 2016).

In this study, the Mobile Services Acceptance Model was used to determine the factors that affect the adoption and the initiative, and individual characteristics. This models was originally proposed by (Gao *et al.,* 2008) but has not been used widely in the literature. The existing literature on mobile systems acceptance largely relics on the seminal research papers on technology acceptance and usage. Although mobile learning has been studied to a large extend, mobile educational services acceptance studies in developing countries, especially the ones carried out in educational setting are quite limited.

2.2.3   Perceived ease of use

Ease-of-use issues have long been considered an important factor affecting m-learning adoption in education. In a research conducted by (Wang *et al.,* 2009) states that there are several challenges facing m-learning, such as connectivity, limited processing power and reduced input capabilities. (Maniar *et al.,* 2008). Furthermore, perceived usefulness have a positive effort on perceived usefulness. TAM describes how work-related information technology (IT) innovations are adopted by employees for their work and their office routines. The key constructs of TAM have been tested, refined and extended in various context since the original publication (Li *et al.,* 2008), which has resulted in a robust adoption model in particular for utilitarian systems.

Van der Heijden (2004) in his study suggested that perceived enjoyment outperforms perceived usefulness in predicting technology acceptance. In some extreme hedonic cases, such as mobile games, perceived usefulness is found to completely lose its predictive power in favor of perceived enjoyment (Ha *et al.,* 2007). These studies indicate a need to validate TAM for the adoption of systems for other than utilitarian reasons such as for education, which is the focus

in the present study. The proposed model considers the influence of perceived ease of use in respect of two external variables including suitability of using mobile devices in learning (Economides & Nikolaou, 2008) and social use of mobile devices and social media produces personalized M-learning (Claudia, 2013).

2.2.4 Perceived (near/long-term usefulness) usefulness

In a longitudinal study on information system (IS) in educational settings, Mendoza *et al.,* (2008) suggest that students may discontinue the use of IT if they cannot perceive long-term benefits or are unable to resolve persistent issues. Note that an educational system can have both near-term usefulness and long-term usefulness for students at the same time. Chiu and Wang (2008) indicated that improving learning performance, effectiveness and productivity represent students' perceived performance expectance (perceived near-term usefulness), while getting a job, a salary raise or a job promotion are sources of utility value (perceived long-term usefulness) of continuously using a web-based learning system. Both constructs are found to be significant predictors of students' behavioral intention. The proposed model considers the influence of two external variables of perceived usefulness which are enjoyment and economic. Enjoyment refers to the felt when using mobile devices for learning and economic refers to M-learning solution that predicts the learner's economic behavior (Andreea & Cristina, 2012).

Also, (Fathema *et al.,* 2015) adopted the concept of near-term/long-term usefulness to study the acceptance of personal computers. They developed a construct of job-fit and defined it as "the degree to which a person believes that using a particular system would enhance his or her task", which is analogous to the perceived usefulness in Tam (Fathema *et al.,* 2015). Meanwhile, they defined long-term consequences of use as outcomes that have a pay-off in the future'. In their study, both structures were found to have significant impacts on personal computer utilization as well. Regarding internet adoption at work. (Bower *et al.,* 2014) stated that perceived near-term consequences significantly and positively influence long-term

consequences. Additionally, perceived long-term usefulness has been proposed or validated to be an important motivator for the acceptance of a number of ICT innovations (Lu, 2014). Constructs analogous to perceived long-term usefulness have been widely used in education research as well. It is essential to include a construct of perceived usefulness in TAM to explain the adoption of educational IS innovations. Instead of offering instant rewards, educational IS innovations, such as M-learning tend to benefit learners in the future and in the long term. When it complies with their future goals, students would be more likely to accept M-learning. This increases a positive feeling of near-term usefulness.

2.2.5 Personal innovativeness

The Individual Innovativeness Theory propounded by Rogers (1995) proposes that individuals tend to react differently to changes that depended on certain traits or predispositions. It focuses on the idea of being adoptive and adaptive to changes, by willing to take risks unlike most others (Bautista *et al.,* 2018). These characteristics make those individuals to accept innovations earlier than others, as they are more or less open to change, and are willing to take more or less risk (Demiralay, 2016; Martins, 2018). Furthermore, the theory suggests that, "some individuals are more innovative than others and for this reason will adopt an innovation earlier than the majority of the group" (Martins, 2018). It also means that such individuations have different degrees of innovations' adaptions (Demiralay, 2016). Martins (2018) maintains that individual innovativeness theory has proven to be a useful tool in developing near- and long-term strategic plans geared towards improving technology integration in schools, particularly in higher educational institutions.

In IS research, personal innovativeness refers to individuals' willingness to try out any new information technology or application. Individuals with higher levels of personal innovativeness are more inclined to develop positive beliefs on new IS innovations compared with those with lower levels. As innovative users tend to be more venturesome and daring, they

are more likely to adopt a new technology innovation despite a high level of uncertainty in new IT adoption. A growing set of IS literature indicates that personal innovativeness is an important construct in understanding new IS/IT diffusion and usage intentions. Specifically, personal innovativeness is a significant predictor for perceived ease of use, and behavioural intentions. Based on personal innovativeness literature, we expected that innovative learners would be the forerunners of m-learning usage and are more likely to develop positive beliefs on m-learning, such as perceived long term usefulness.
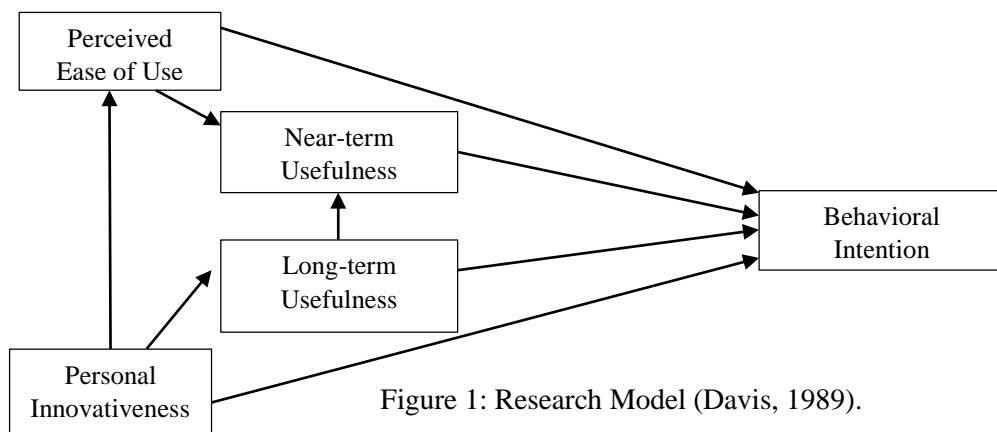
Figure 1: Research Model (Davis, 1989).

2.2.6 Adoption and usage of mobile devices in education

According to Said (2015) he states that, notwithstanding high possession, longitudinal information demonstrates that utilisation of versatile innovation in learning isn't as far-reaching as the gadgets themselves. The ongoing study demonstrated that 50 per cent of learners revealed that they do homework every day from cell phones or tablets, which is a generally little rate contrasted with the 86 per cent proprietorship measurements. Additionally, learners are not as proficient at utilising portable innovation as the gadgets' fame recommends. To put it plainly, possession doesn't have an immediate relationship to capability. In any case, the reality remains that learners utilise portable learning gadgets for scholarly work and many of

them own such devices. Irby and Strong (2015) argued that studies of the acceptance and use of mobile information systems in education suggest that the technology is widely used, among majority of college students, who rely on the technology in a variety of ways. Also, Park (2011) stated that the ubiquity of mobile devices allows educational professionals to use it in a variety of instructional settings.

In a work conducted by Trebbi (2011), he considered the influence of information technology on educational practices as creating a new frontier for learning, with novel roles for teachers and students. Demirbilek (2010) also suggested that the growing nature of mobile devices in educational setting has created an urgent need to examine how educators perceive the use of mobile technology with their teaching portfolios. In a survey conducted by Chen (2014) where students using mobile devices; were sent a message about upcoming English lessons via the university's information system, he found that students who received email via mobile devices learned more.

Adoption of mobile devices and system in education has increased Cheon *et al.,* (2012) suggested that the increased use of mobile devices by students in higher education, compared to primary and secondary school students, may lead to quicker adoption of information systems in college and university settings. Many academic institutions in Turkey have been providing various smart phone based services for both of their students and staff, such as Sakarya University's SABIS, Middle East Technical University's METU portal. These services may offer many advantages to the students including choosing lessons, learning course content and showing exam results, with access available any time and any place. Efficient acceptance and usage of mobile educational services are strongly related with mobile learning utilization and acceptance by university students (Liu *et al.,* 2010).

2.3   Empirical Studies

Educators opposed to using mobile devices do not believe that mobile devices have rewired students' brains. Instead, they might point to Willingham (2010), who advised that students may have convinced themselves they can multitask, however, no human can do that. Willingham found that people are not doing at least two things simultaneously when multitasking; rather, they are switching back and forth between various errands-and doing each ineffectively and wastefully. Also, Harman and Sato ((2011) examined the effect of cell phones use on academic performance among 88 university students. They found that higher messaging rates and incoming calls may interfere with learning.

In a related study of the relationship between multitasking, studying and academic performance, Junco and Cotton (2012) also reported that multitasking such as texting or using Facebook while studying was negatively correlated with university GPA. Also Hong *et al.,* (2012) found that calling and texting were positively correlated with a self-reported measure of academic difficulty among a sample of female Taiwanese University students. Kafyulilo (2012) also studied teachers' perceptions of cell phone use and found that they emphasized a decrease in the use of cell phones because of their negative impact on student conduct.

Thomas *et al.,* (2014) identified the determinants of mobile learning adoption, including internet, access, educational programs, calculators, and calendars. Potential obstacles include student cheating, inappropriate information on the internet, cyber bullying, and disruptions. Furthermore, Enayati *et al.,* (2014) conducted a study on the use of mobile phones in providing educational content to students. The result indicated that transferring course materials via mobile phones and text messages are effective in learning; however, this method of transferring educational content does not offer any advantage over lectures. In a research on feasibility of implementing mobile-based-learning (mobile learning) at university, (Karimi *et al.,* 2014)

found that it was possible to establish a mobile based learning system at Payam-e-Noor University in terms of hardware and software infrastructures, financial resources and support.

Gan and Balakrishnan (2014) also examined the factors that can affect mobile learning acceptance and enhance teacher-student interaction during lectures, including: ease of use, self-efficacy, and enjoyment. Ilci (2014) also investigate the levels of mobile learning readiness and mobile learning acceptance in pre-service teachers in the Faculty of Education at Middle East Technical University. The results suggested that the levels of m-learning readiness and m-learning acceptance among pre-service teachers were moderate. In another research conducted by (Lepp *et al.,* 2015) reported that students who used the cell phone more on a daily basis were likely to have a lower GPA than students who used it less. Basing their conclusions on a sample of 536 undergraduate from 82 self-reported majors at a large public university, the researchers suggested a vital need to sensitize students and educators about the potential academic risk associated with high cell phone use.

More so, in research conducted by Chen (2016) who examined students' and faculty members' perception and acceptance of using mobile in learning, and their results indicated a positive relationship between perception and acceptance. In a research conducted by Olaitan and Olusegun (2017), they also found out that gender is an important factor that determines mobile phone uses among adolescents, that is, male and female college students showed different attitude to their mobile phones and they exploit their (mobile phone) feature differently.

In a mixed method research study, Celik and Karayaman (2018) examined the attitudes of prospective mathematics teacher's toward mobile learning, and the result showed that they had possible attitude toward mobile learning. They started that this type of learning has some advantages and disadvantages. It may be used in extracurricular environments and increase course success but it is not economical. Brown (2018) who addressed education teachers'

perceptions of mobile learning, and the results that mobile learning techniques and tools were useful in teaching and learning approaches, effective in formulating classroom instruction strategies, useful for professional learning, influential over time constraints when acquiring knowledge at any time and place, and facilitating teacher-student communication.

In a qualitative study conducted by Chun (2019) sought to examine the experiences of teachers in using mobile learning systems. His findings identified five topics, including; teachers' perception of mobile learning, motivations for adopting mobile learning, standards of conduct in the use of mobile learning, the challenges to the acceptance of mobile learning, and the benefits of using mobile learning. Also in another study, Bere and Rambe (2019) examined mobile learning in higher education in a developing country, their findings suggest opportunities for collaborative learning through knowledge sharing, developing academic communities, and immediate communication. They concluded that mobile learning in this study can create shared learning environments, which can in turn enhance active learning opportunities.

In a work conducted by (Sharifa *et al.,* 2019) on smartphone usage among university students in undergraduate nursing education Saudi Arabia where 135 college respondents were use, they found that 94.8% student carry their phones consciously at all times whereas 92.6% check their phones as soon as they arise in the morning. In recent years, more studies were carried out on smartphone use in relation to academic performance.

2.4   Summary of Literature Review

The importance of information communication technology in education in our society is unaccountable. Its impact will continue to improve the standard of education sector in our country. The ability to improve in the use of technology as instructional aids in teaching and learning situation is very essential in other to improve in our educational standard. Despite the

important of technology in education, the interaction of technology with conventional classroom is still limited in our society. With the hike in different insurgence in our society the need for improvement in technology toward teaching and learning is a thing of concern to an individual and government. In an attempt to improve in technology in education, the use of mobile devices which is common to every individual especially adolescent in our society will be a good pathway for teaching and learning purposes.

The review of this study has recognized that mobile devices usage in teaching and learning will result in production of good standard education to the citizen at this era of technology. Mobile learning has been seen as means of enhancing flexibility of learning, increase accessibility and improve students' learning experience among others. In attempt to incorporate mobile learning effectiveness, different strategies has been adopted with emphasis on availability of good internet access in the school premises and provisions of mobile devices or other electronic gadgets for both the students and lecturers or improvement on bring your own policy method. The literature review so far has shown that study on strategies for enhancing effectiveness utilization of mobile devices is scanty; hence this study will fill the gap in literatures.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1   Design of the Study

The design of the study is quasi-experimental research design. A quasi-experimental design involves the pre-test, post-test non-equivalent control group design. This design was adopted because it was not possible for the researcher to randomly sample the subjects and assign them to groups without disrupting the academic programs of the schools involved in the study. In this approach the participant were not randomly drawn and assigned to experimental and random control groups, rather intact class were randomly selected through multi stage sampling technique that is why the quasi-experimental design is used. The study used two groups; experimental and control. This design was prescribed by Kerlinger (1973) and used Thomas and Israel (2014).

Table 3.1 Research Design Layout

Grouping	Pretest	Treatment	Posttest	Retention
EXP (Instagram)	O_1	X_1	O_2	O_3
Control (CLM)	O_4	X_0	O_5	O_6

Keys:

Where:

O_1 and O_4 = represent Pre-test scores for experimental group and Control group

O_2 and O_5 = represent post-test scores for experimental group and Control group

O_3 and O_6 = represent retention scores for experimental group and control group

X_1 represent Instagram for experimental group

X_0 represent traditional method for control group

3.2   Population of the Study

The population of senior secondary schools in Bosso Local Government compromised of one thousand, seven hundred and fifty (1,750). The senior secondary schools used for the study were selected from Bosso Local Government Area of Minna, Niger state. 815 were male students while 935 were female students of average age of 15-17 years plus. The target population comprises of 119 students of two selected secondary school from the sampled population.

3.3   Sample and Sampling Techniques

A total number of 119 SS II geography students drawn from two (2) senior secondary schools of Bosso Local Government Education Zone form the sample of the study. Subjects were randomly assigned to experimental and control groups before the administration of treatment using a simple random sampling technique. Two classes (one from the experimental group and one from the control group) were used for the study. The experimental group consist of 63 students (26 male and 37 female) and control group consist of 56 students (32 male and 24 female) respectively.

Table 3.2   Sample Population Distributions in Sampled Schools

Group	School	Male	Female	Total
Experimental	FUT Minna Sec. school	26	37	63
Control	Government Model Sec. school	32	24	56
Total		**58**	**61**	**119**

3.4   Research Instrument

The research instruments used for this study is: Geography achievement test (GAT). The treatment instrument that were used is a mobile device platform (Instagram). The test instrument are Geography Achievement Test (GAT) and Geography Retention Test (GRT).

3.4.1 Test Instrument

The test instrument for data collection for this study is Geography achievement test. Which was administered to both experimental and control group, the achievement test was based on geography. The experimental group received experimental treatment, teaching using mobile device platform (Instagram) as instructional package. While the control group was taught using lecture method by the researcher. Both Experimental and control groups were pre-tested on academic achievement before the administration of treatment. The essence of pre-testing was to ensure the selection of samples that are not significantly different in abilities in terms of academic achievements before treatment. The Geography achievement test was based on SSII Geography on concepts of climate.

3.5 Validity of the Instrument

Validity establishes the relationship between the data and the variable or construct of interest. The instrument was validated by an expert from Department of Educational Technology, Federal University of Technology, Minna and geography teacher from Model Secondary School, Federal University of Technology Minna for content and validity in terms of its suitability for instruction, simplicity, and emphasis on key concepts and text. The expert's comments and suggestions were also used to correct some mistakes while their suggestions were used.

3.6 Reliability of the Instrument

The reliability of the instrument in this research was determined using a test-retest technique. To test the reliability of the instrument, it was pilot tested on 20 SSII Students randomly selected from Ahmadu Bahago Secondary School Minna. The data were collected and analysed using Pearson Product Moment Correlation (PPMC) to obtain the value of reliability coefficient (r) to be 0.78 which shows the instrument is reliable.

3.7   Method of Data Collection

The researcher visited and seeks permission from the selected school administration to use the school facilities and also ask for the co-operation from the staff and students in the selected school. The experimental group were taught through mobile device platform (Instagram) while the normal conventional method was used to teach the control group, before the treatment, the researcher administer pre-test to the two groups in order to test their entry knowledge. After the lesson (treatment) by the researcher assistant to both groups, after which a post test was administered. The scores for both the experimental and control group were recorded accordingly. The test items in both the pre-test and post-test were scored one ('1') marks for each correct answer and ('0') for each wrong answer.

3.8   Method of Data Analyses

The data collected was analyzed and the results were presented using the mean and standard deviation to analyze data and provide answers to the research questions. Mean and standard deviation were used because mean is the most reliable measure to central tendency and the most reliable estimate of variability while Analysis of Variance (ANOVA) were used to analyze post-test scores.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1   Introduction

This chapter presents the data collected, results and their analyses. This was done in agreement with the formulated null hypotheses stated in chapter one and it deals with the discussion of the findings of the research. The average scores the experimental and control groups were scrutinized using mean, standard deviation and ANOVA statistics as shown in tables below.

4.2   Data Obtain from the Research Question

The data collected for the purpose of this study were analysed based on the research questions and hypothesis formulated.

Research Question 1: What is the mean difference in the achievement scores of students taught geography using Instagram a mobile device platform and those taught using conventional method?

Table 4.1:   Mean and Standard Deviation of the Experimental and Control Groups in Achievement Test

Groups	N	Pre-test		Post-test		Mean difference
		$\bar{x}$	SD	$\bar{x}$	SD	
Experimental	63	49.22	1.22	76.94	2.05	27.72
Control	56	37.68	0.79	56.07	2.04	18.39

The data presented in Table 4.1 shows that the experiential group had a mean score of 49.22 and standard deviation of 1.22 in the pre-test and a mean score of 76.94 and standard deviation of 2.05 in the post-test making a pre-test post-test difference in the experimental group to be 27.72. The control group had a mean score of 37.68 and a standard deviation of 0.79 in the pre-test and a post-test mean of 56.07 and a standard deviation of 2.04 with a pre-test post-test

difference of 18.39. With this result, the students in the experimental group performed better in the achievement test than the students in the control test.

Research Question 2: What is the difference in the mean retention scores of students taught geography using Instagram a mobile device platform and those taught using conventional method?

Table 4.2: **Mean and Standard Deviation of Experimental and Control Groups in Retention Test**

Groups	N	Pre-test		Post-test		Mean difference
		$\bar{x}$	SD	$\bar{x}$	SD	
Experimental	63	52.10	10.94	47.21	21.05	4.89
Control	56	76.19	6.71	59.91	11.67	16.28

Results in Table 4.2, shows that the experiential group had a mean score of 52.10 and standard deviation 10.94 in the post-test and a mean score of 47.21 and standard deviation of 21.05 in the retention making a post-test, retention scores difference in the experimental group to be 4.89. The control group had a mean score of 76.19 and a standard deviation of 6.71 in the pre-test and a retention mean of 59.91, and a standard deviation of 11.67 with a pre-test, retention scores difference of 16.28. With the result, the students in the control group performed better. The student in the experimental group were unable to perform better.

Research Question 3: What is the mean difference in the achievement scores of male and female students taught geography using Instagram as a mobile device tool?

Table 4.3: **Mean and Standard Deviation of Achievement mean score of male and female Groups of Student taught geography using Instagram**

Groups	N	Pre-test		Post-test		Mean difference
		$\bar{x}$	SD	$\bar{x}$	SD	
Female	37	47.21	12.22	66.74	10.94	19.53
Male	26	37.32	9.04	54.99	8.61	17.67

Results in Table 4.3 shows that the female group had a mean score of 47.21 and standard deviation 12.22 in the pre-test and a mean score of 66.74 and standard deviation of 10.94 in the post-test making a pre-test post-test score difference in female group to be 19.53. On the other hand, the male group had a mean score of 37.32 and a standard deviation of 9.04 in the pre-test and a post-test mean of 54.99 and a standard deviation of 8.61 with a pre-test post-test difference of 17.67. The result shows that there is a different between the mean achievement scores of female and male students when exposed to experimental condition in favor of the female.

Research Question 4: What is the difference in the mean retention scores of male and female students taught geography using Instagram as a mobile device tool.

Table 4.4: **Mean and Standard Deviation of Retention mean score of male and female Groups of Student taught geography using Instagram.**

Groups	N	Pre-test		Post-test		Mean difference
		$\bar{x}$	SD	$\bar{x}$	SD	
Female	37	76.19	12.09	76.14	16.70	0.05
Male	26	67.14	9.70	77.62	15.90	10.48

Results in Table 4.4 shows that the female group had a mean score of 76.19 and standard deviation 12.09 in the post-test and a mean score of 76.14 and standard deviation of 16.70 in the post-test making a pre-test post-test difference of 0.05. On the other hand, the male group had a mean score of 67.14 and a standard deviation of 9.70 in the pre-test and a post-test mean of 77.62 and a standard deviation of 15.90 with a pre-test post-test difference of 0.48. The result shows that there is a different between the mean retention scores of female and male students when exposed to experimental condition the male students were able to retain more.

4.3 Hypotheses Testing

Hypothesis 1: There is no significant difference in the achievement scores of students taught geography using mobile devices and those taught using conventional method

Table 4.5: **Summary of Analysis of Variance (ANOVA) for Posttest between Experimental and Control Groups**

Source	Sum of Squares	df	Mean Square	F	P-Value
Between Groups	29.593	9	3.29		
Within Groups	195.389	46	4.25	0.77	0 .64
Total	224.982	55			

*Significant at P< 0.05

Table 4.5: The result reveals that there was no significant difference in the mean scores of experimental and Control Groups with F (1, 46) = 0.77, P > 0.05. Hence there was no significant difference between the mean achievement scores of students of experimental and control which indicates that both the group are at the same level of academic achievement before the administration of instrument.

Hypothesis 2: There is no significant difference in the retention scores of students taught geography using mobile devices and those taught using conventional method.

Table 4.6: **Summary of Analysis of Variance (ANOVA) for Retention between Experimental and Control Groups**

Source	Sum of Squares	df	Mean Square	F	P-Value
Between Groups	22.745	7	3.25		
Within Groups	135.469	48	2.82	1.15	0 .35
Total	158.214	55			

*Significant at P > 0.05

Table 4.6: the result reveal that there was no significant different in the mean score of experimental and control Group with F (1, 48) = 1.15, P > 0.05. Hence the null hypothesis stated was accepted.

Hypothesis 3: There is no significant difference in the achievement scores of male and female students taught geography using mobile devices and lecture method.

Table 4.7:   Summary of Analysis of Variance (ANOVA) for Posttest between Male and Female students

Source	Sum of Squares	df	Mean Square	F	P-Value
Between Groups	0.149	1	0 .15		
Within Groups	229.208	54	4.25	0.04	0.85
Total	229.357	55			

*Significant at P ＞ 0.05

Table 4.7: the result reveal that there was no significant different in the mean scores of male and female students that was taught climate with the use of mobile devices with F $(1, 54)$ = 4.25, P ＞ 0.05. Hence the null hypothesis stated was retained.

Hypothesis Four: There is no significant difference in the retention scores of male and female students taught geography using mobile devices and those taught with conventional method.

Table 4.8:   Summary of Analysis of Variance (ANOVA) for Retention between Male and Female students

Source	Sum of Squares	df	Mean Square	F	P-Value
Between Groups	0.001	1		0.00	
Within Groups	153.427	54	2.84	0.98	0.00
Total	153.429	55			

*Significant at P＜ 0.05

Table 4.8: the result reveal that there was no significant different in the mean score of male and female students that was taught climate with the use of mobile devices with F $(1, 54)$ = 0.98, P ＜ 0.05. Hence the null hypothesis stated was rejected. Therefore, there is significant difference in the retention scores of male and female students taught geography using mobile devices and lecture method.

4.4   Discussion of Results

Hypothesis one, the summary analysis of the posttest mean score of Experimental and Control Groups using one-way ANOVA statistics in SPSS. A p-value of 0.05 was reported indicating a difference between experimental and control groups. This reveals that there was no significant difference in the mean scores of Experimental and Control Groups. Hence, the null hypothesis stated above was retained. The differences might be as a result of blending conventional teaching method with a proper instructional material for example the mobile device platform (instagram) used for this studies which make the findings in line with the work of Egunjobi, (2014) states that indicates a higher gain in the achievement scores of an experimental group to that of a control groups.

Hypothesis two, the analysis of the retention scores of Experimental and Control Groups using one-way ANOVA in SPSS. The p-value was significant at 0.05 level. This reveals that there was no significant difference in the retention mean scores of Experimental and Control Groups. Hence the null hypothesis stated above that there is no significant difference on the retention scores of Senior Secondary School students taught climate with instagram and those taught with conventional method is thereby retained.

Hypothesis three, the analysis of the mean scores of male and female students that were taught climate with the use of instagram using one-way ANOVA statistics in SPSS. The p-vale was not significant at 0.05 level. This reveals that there was no significant difference in the mean scores of male and female students that were taught climate with the use of instagram. Hence the null hypothesis stated above was retained the outcome might be as a result of instructional materials burst their knowledge. Therefore, it can be said that the use of mobile devices is more effective for improving students' creativity (fluency, originality, flexibility, and elaboration) and creativity compared to the traditional lecture method and also the use of mobile devices

has the potential to be an effective instructional tool and also enhance student academic achievement in geography. Also male and female students taught with mobile device application performed better than student taught through lecture method.

Hypothesis four, the analysis of the retention scores of male and female students that were taught climate with the use of instagram using one-way AANOVA statistics in SPSS. The p-value was not significant at 0.05 level. This reveals that there is a significant difference between the mean retention scores of male and female students taught climate with the use of instagram. Hence the null hypothesis stated above there is no significant difference on the retention scores of male and female students taught climate with the use of instagram is thereby rejected. This agree with the finding of Sakiyo and Waziri (2015) who reported that no significant difference between male and female students in the experimental group.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Based on the major findings of this study, the researchers concluded that the utilization of the mobile devices is efficient for teaching geography and significantly improved the achievement of students in geography concepts. It was also concluded that students' gender had no considerable influence on the achievement of result in geography. Mobile device tools can therefore, be utilized to develop geography proficiencies and improve the achievement of students in geography despite their gender.

5.2 Recommendations based on the Findings

Based on the findings, the following recommendations are put forward:

1. The use of mobile devices has been established to improve achievement in learning geography concepts. The use of mobile devices for teaching should be popularized by incorporating them into the geography curriculum.

2. The female, as well as male students, benefitted equally when taught the concept of geography and maps using mobile devices. Based on this finding the female and male students should be encouraged to pursue most of geography based courses like metrology, remote sensing, among others. Since most of the abstract concepts can now be explain using mobile devices. It makes such concepts to be easily conceptualized.

3. The proprietors of schools should endeavor to provide standard ICT facilities that will bring about effective and efficient learning in schools.

4. Regular professional development programs on the use of mobile learning devices should be organized for geography teachers by the Science Teachers Association of

Nigeria and other major stakeholders in science education to enable geography teachers to update their pedagogic skills.

5. Curriculum planners should include the use of different mobile learning platforms as an essential instructional method for teaching geography in senior secondary schools in Nigeria.

5.2.1 Contributions to knowledge

This study empirically establishes that;

1. The use of the mobile devices enhances students learning abilities, creativity by affecting positively their achievement in geography concepts.

2. The use of mobile devices promotes independent efforts from students, to search for answers themselves instead of relying on their teachers. The self-search leads to self-reliance and greater information gathered from widely available scientific sources.

3. Mobile devices enhance a more stimulating effect on both male and female students. Therefore, there is no significant difference between males and females in their achievement in geography.

5.3 Suggestions for Further Studies

The following suggestions were made for further research:

1) The research work is limited to only Minna metropolis; further research cam be carried out in another state.

2) This study can be carried out using other topics in geography.

3) Mobile device applications can be used in other science and non-science subjects and other fields of study.

4) Opportunity should be given for continuous research on strategy with a view to improve the use of mobile devices and also enhance its potential.

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APPENDIX A

Geography Achievement Test (GATOC)

1. Climate can be defined as?
   a) World metrological organization
   b) Change in solar emission in the earth's orbit.
   c) The average weather condition in a given area over a long period of time.
   d) Average percentage of rainfall and sunshine in a particular area
   e) Tropical weather with high amount of humidity

2. A description of climate includes information on the following **except**?
   a) Temperature in different season
   b) Rainfall
   c) Sunshine
   d) Precipitation
   e) All of the above

3. The five climatic division is known as ….…..?
   a) Climate classification
   b) Koppen climate classification
   c) Temperate climate classification
   d) None of the above
   e) All of the above

4. The following influence climate **except**?
   a) Latitude
   b) Thunderstorm
   c) Elevation
   d) Ocean and wind currents.
   e) All of the above

5. Global climate are often divided into…………..?
   a) 4
   b) 6
   c) 8
   d) 5
   e) 2

6. A long-term shifts in temperatures and weather patterns is known as ……….?
   a) Climate change
   b) Atmospheric condition
   c) Evapotranspiration
   d) Climate system
   e) All of the above

7. Weather station is a facility, either on land or sea, with instruments and equipment for measuring atmospheric condition to provide information on weather forecast and to study weather and climate.
   a) True   b) False

8. The following are instrument for measuring weather conditions **except**?
   a) Thermometer
   b) Barometer

c) Rain gauge
d) Climate speed
e) Hygrometer

9. Wind vane is also called ……………?
   a) Automated machine
   b) Weathercock
   c) Barometer
   d) Windsock
   e) None of the above

10. Climate change is as a result of the following **except**……?
    a) Variation in sunlight intensity
    b) Human activities
    c) Processes internal to the earth
    d) Deforestation
    e) Global warming

11. The barometer is used to measure ……………?
    a) Humidity
    b) Wind speed
    c) Atmospheric pressure
    d) Wind direction
    e) Sun direction

12. …………..instrument is used to measure liquid precipitation over a set period of time.
    a) Rain gauge
    b) Wind vane
    c) Anemometer
    d) Thermometer
    e) Wind sock

13. The following are characteristics of tropical climate **except** …….?
    a) High average temperature
    b) Large amount of rainfall
    c) Monthly temperature above freezing
    d) Include rainforest and savannah
    e) All of the above

Use the diagram to answer question 14 and 15

14. From the diagram above, the type of climate is known as………?
    a) Tropical climate
    b) Dry climate
    c) Temperate climate
    d) Continental climate
    e) Polar climate

15. The following are the characteristics of the climate **except**………?
    a) Known as arid or semi-arid climates.
    b) Have heavy rainfall throughout the year.
    c) Deserts are often found in this type of.
    d) Yearly temperature is usually above 64 degree Fahrenhiet.
    e) None of the above

16. Polar climate remain very cold throughout the year with temperature ranging between negative 70 degree and 20 degree Fahrenheit.
    a) True
    b) Maybe
    c) False
    d) None of the above
    e) All of the above

17. Temperate region are also known as ……..?
    a) Biomes
    b) Temperate tropics
    c) Middle latitude climates
    d) Marine regions
    e) Micro thermal

Use the diagram to answer question 18 and 19.

18. The diagram above indicate ………….type of region
    a) Humid region
    b) Tropical region
    c) Dry region
    d) Polar region
    e) None of the above.

19. Biomes have tropical climate rainforest and savannas.
    a) False   b) True

20. Geographical disribution and different climate type affect human activites
    a) True   b) False

Geography Achievement Test (GAT) Answers

1) C

2) E

3) B

4) B

5) D

6) A

7) True

8) D

9) B

10) E

11) A

12) C

13) C

14) B

15) B

16) A

17) C

18) B

19) B

20) A

Geography Retention Test (GRT)

1. The following influence climate **except**?
   a) Latitude
   b) Thunderstorm
   c) Elevation
   d) Ocean and wind currents.
   e) All of the above

2. The five climatic division is known as ……...?
   a) Climate classification
   b) Koppen climate classification
   c) Temperate climate classification
   d) None of the above
   e) All of the above

3. Global climate are often divided into…………..?
   a) 4
   b) 6
   c) 8
   d) 5
   e) 2

4. Climate can be defined as?
   a) World metrological organization
   b) Change in solar emission in the earth's orbit.
   c) The average weather condition in a given area over a long period of time.
   d) Average percentage of rainfall and sunshine in a particular area
   e) Tropical weather with high amount of humidity

5. A long-term shifts in temperatures and weather patterns is known as ………?
   a) Climate change
   b) Atmospheric condition
   c) Evapotranspiration
   d) Climate system
   e) All of the above

6. Weather station is a facility, either on land or sea, with instruments and equipment for measuring atmospheric condition to provide information on weather forecast and to study weather and climate.
   a) True   b) False

7. The following are instrument for measuring weather conditions **except**?
   a) Thermometer
   b) Barometer
   c) Rain gauge
   d) Climate speed
   e) Hygrometer

8. A description of climate includes information on the following **except**?
   a) Temperature in different season
   b) Rainfall

c) Sunshine
d) Precipitation
e) All of the above

9. Wind vane is also called ……………?
   a) Automated machine
   b) Weathercock
   c) Barometer
   d) Windsock
   e) None of the above

10. Climate change is as a result of the following **except**……?
    a) Variation in sunlight intensity
    b) Human activities
    c) Processes internal to the earth
    d) Deforestation
    e) Global warming

11. The following are the characteristics of the climate **except**………?
    a) Known as arid or semi-arid climates.
    b) Have heavy rainfall throughout the year.
    c) Deserts are often found in this type of.
    d) Yearly temperature is usually above 64 degree Fahrenhiet.
    e) None of the above

12. …………..instrument is used to measure liquid precipitation over a set period of time.
    a) Rain gauge
    b) Wind vane
    c) Anemometer
    d) Thermometer
    e) Wind sock

13. The following are characteristics of tropical climate **except** …….?
    a) High average temperature
    b) Large amount of rainfall
    c) Monthly temperature above freezing
    d) Include rainforest and savannah
    e) All of the above

Use the diagram to answer question 14

14. From the diagram above, the type of climate is known as………?
    a) Tropical climate
    b) Dry climate
    c) Temperate climate
    d) Continental climate
    e) Polar climate

15. Polar climate remain very cold throughout the year with temperature ranging between negative 70 degree and 20 degree Fahrenheit.
    a) True
    b) Maybe
    c) False
    d) None of the above
    e) All of the above

16. Temperate region are also known as ……..?
    a) Biomes
    b) Temperate tropics
    c) Middle latitude climates
    d) Marine regions
    e) Micro thermal

17. Geographical disribution and different climate type affect human activites
    a) True   b) False

18. The barometer is used to measure ……………?
    a) Humidity
    b) Wind speed
    c) Atmospheric pressure
    d) Wind direction
    e) Sun direction

Use the diagram to answer question 19 and 20

19. The diagram above indicate ………….type of region
    a) Humid region
    b) Tropical region
    c) Dry region
    d) Polar region
    e) None of the above.

20. Biomes have tropical climate rainforest and savannas.
    a) False   b) True

Geography Retention Test (GRT) Answers

1) B

2) B

3) D

4) C

5) A

6) A

7) C

8) E

9) B

10) E

11) C

12) C

13) C

14) B

15) A

16) C

17) A

18) A

19) B

20) B

APPENDIX C

Dear Sir/Madam,

Instrument Validation Form

The bearer is a student of the above named University and Department. She/he is conducting a research and you have been selected as one of those with requisite expertise to validate his/her instrument. Kindly grant him/her all necessary assistance to make the exercise a success.

Your competency and expertise was considered as factors that will serve to improve the quality of his/her research instrument. We therefore crave for your assistance in validating the instrument. The completion of the form serves as evidence that the student actually validated the instrument.

Thanks for your anticipated assistance.

Dr. C. S. Tukura

14 FEB 2023   14/2/2023

Head of Department (Signature, Date & Official Stamp) +

Student's Surname.....IBRAHIM.....................Other Names...MARYAM B

Registration Number...2016/1/58892BT..... Programme.........B-TECH

Title of the Instrument........GEOGRAPHY ACHIEVEMENT TEST

ATTESTATION SECTION

Summary of the Remark on the Instrument. The instrument is good and well designed based on the subject matter

I hereby attest that the above named student brought his instrument for validation

Name of Attester.....DR. I. I. Kuba

Designation......AP

Name and Address of Institution..FUT, Minna

Phone Number.......08035837865.........E - Mail......

Please comment on the following

1. Appropriateness of the instrument for the purpose it's design for.............................
   ....Satisfactory...
2. Clarity and simplicity for the level of the language used...
   ....Good...
3. Suability for the level of the targeted audience ....
   ....Adequate...
4. The extent in which the items cover the topic it meant to cover.................................
   ....Maximum...
5. The structuring of the Questionnaire...
   ....Good...
6. Others (grammatical errors, spelling errors and others..
   ....Minimal...
7. General overview of the Instrument..
   ....Good...

Suggestions for improving the quality of the Instrument

1. ....Effect all the corrections as pointed out accordingly
2. ....
3. ....
4. ....
5. ....

Name of Validator... DR. I. J. Kuta
Area of Specialization... Educational Technology
Name of Institution.... FUT, Minna ....Designation.... AP
Signature................Ismail...Date. 20/3/23

Thank You

59

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA
SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION
DEPARTMENT OF EDUCATIONAL TECHNOLOGY

Dear Sir/Madam,

Instrument Validation Form

The bearer is a student of the above named University and Department. She/he is conducting a research and you have been selected as one of those with requisite expertise to validate his/her instrument. Kindly grant him/her all necessary assistance to make the exercise a success.

Your competency and expertise was considered as factors that will serve to improve the quality of his/her research instrument. We therefore crave for your assistance in validating the instrument. The completion of the form serves as evidence that the student actually validated the instrument.

GENERAL

Thanks for your anticipated assistance.

Dr. C.S. Takuno

24/2/2023

Head of Department (Signature, Date & Official Stamp)

Student's Surname... IBRAHIM .... Other Names MARYAM Bolanle

Registration Number... 2016/1/58892BT ...... Programme... B TECH

Title of the Instrument... GEOGRAPHY ACHIEVEMENT TEST

ATTESTATION SECTION

Summary of the Remark on the Instrument... the instrument
is well structured and has captured
the targeted audience.

I hereby attest that the above named student brought his instrument for validation

Name of Attester... Aliyu Atlijo Muhammad

Designation... Subject Teacher

Name and Address of Institution. Model Secondary School FUT Minna.

Phone Number... 08067926303 .... E-Mail Aliiyuu99@gmail.com

Please comment on the following

1. Appropriateness of the instrument for the purpose it's design for... *the instrument is precise*
2. Clarity and simplicity for the level of the language used. *The language used is simple and understandable*
3. Suability for the level of the targeted audience... *it is quite suitable*
4. The extent in which the items cover the topic it meant to cover... *It has relatively cover the topic areas*
5. The structuring of the Questionnaire... *Well structured*
6. Others (grammatical errors, spelling errors and others)... *none*
7. General overview of the Instrument... *The Instrument is concise and relatively accurate*

Suggestions for improving the quality of the Instrument

1. ....
2. ....
3. ....
4. ....
5. ....

Name of Validator... *Alhaji Alhaji Muhammad*
Area of Specialization... *Geography Education*
Name of Institution *Model Secondary Sch Fut* Designation *Teacher*
Signature... *A.M.* Date. *21/8/23*

Thank You

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