

**AWARENESS, PERCEPTION AND ATTITUDE OF UNDERGRADUATE PRE-SERVICE TEACHERS ON THE USE OF MOBILE LEARNING TECHNOLOGIES FOR LEARNING PURPOSES IN NIGER STATE**

**BY**

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## ABSTRACT

The aim of the study was to investigate the Awareness, Perception and Attitude of Undergraduate Pre-Service Teachers on the Use of Mobile Learning Technologies for Learning Purposes in Niger State. The study adopted a descriptive survey design carried out on 300 randomly sampled undergraduate pre-service teachers drawn from a population of 2,713 pre-service teachers in tertiary institutions in Niger State, using the Krejcie and Morgan (1970) sample size determination table. Six research questions and three hypotheses were formulated to guide this study. Data were collected using a researcher-designed questionnaire structured in four sections A, B, C, and D containing 30 items. Section A was used to collect demographic data of the respondent, while section B, C, and D containing 10 items each was used to collect data on awareness, perception, and attitude respectively. The questionnaire was content and face validated by experts to determine the suitability. The reliability of the instrument was determined after being pilot tested and reliability coefficients of 0.85, 0.82, and 0.79 were obtained for awareness, perception, and attitude respectively using Cronbach Alpha, which indicated that the instrument was reliable for data collection. Mean and standard deviation were used to answer the research questions. The formulated hypotheses were analyzed using t-test analysis. Findings from the study revealed that undergraduate pre-service teachers' awareness, perception and attitude on the use of mobile learning technologies for learning was positive with a calculated Mean scores of 4.21, 4.18 and 4.15 respectively. The analysis of the hypotheses revealed that there was no gender significance in the awareness, and perception of undergraduate pre-service teachers on the use of mobile learning technologies for learning with the p-value of 0.658 and 0.095 respectively. However, the analysis revealed that there was a gender significance in their attitude as male tends to exhibit significantly more positive attitude towards the use of mobile learning technologies for learning than female, the p-value calculated for attitude is 0.022. Based on these findings, it was recommended that undergraduate pre-service teachers should be encouraged to adopt mobile learning technologies in order to enhance their independent learning ability and help build self confidence. Also, governments and schools should ensure continuous sensitization of students on mobile learning technologies as they provide easy access to online learning materials and easy flow of information between teachers and students.

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## **CHAPTER ONE**

### **1.0**

### **INTRODUCTION**

#### **1.1 Background to the Study**

Education is influenced by socio-economic development of a nation and the changes taking place within it. The education system that was developed and implemented a few centuries ago differs from the one existing today such as the current innovation of E-learning platforms. Societies are experiencing many challenges as a result of the changes in classroom instructions, these challenges are attributed to the breakthrough and advancement in modern Information and Communication Technologies (ICT) which played major role in shaping education sector (Besio, 2017). The advancement of Information and Communication Technologies (ICT) and proliferation of electronic knowledge has reshaped the way knowledge in schools and universities is delivered and

managed (Naji *et al.*, 2011). In other words, new forms of education systems are evolving resulting in emerging novel learning and teaching methods which differ significantly from the traditional approaches. For instance, the way teachers and students interact is not just based in face-to-face traditional classroom settings. Instead, modern Information and Communication Technologies enable students and teachers to interact freely anytime in disperse location. Teaching and learning has become flexible and possible through the use of mobile technologies. The provision of learning services through mobile devices is commonly called Mobile Learning (m-learning) (Salmon, 2015).

Mobile learning refers to the use of mobile or wireless devices for the purpose of learning while on the move. Cell phones, smartphones, palmtops, and handheld computers, tablet PCs, laptops, and personal media players can be seen as typical examples of the devices used for mobile learning (El-Hussein & Cronje, 2010). It is important to understand the dimensions of computer and allied technologies based education to adequately appraise their potential in learning experience. Computer Based Education (CBE) was one of the initial stages, leading to online education and e-learning in the mid-1990s. E-learning offered new ways for students to access many resources. This was a major breakthrough in education leading to better management of both in-house tertiary education and distance education. According to Liu *et al.* (2010), modern technology-aided learning is found in three stages ranging from conventional e-learning to m-learning to context-aware u-learning. Conventional e-learning refers to using computer and the Internet for learning. This is where computer plays a vital role in modern education and pedagogy. Mobile learning (m-learning) is realized with mobile devices and wireless communication.

Al Emran and Shalaan (2014), demonstrated that m-learning facilitates knowledge sharing among students and educators while interacting with each other. Matias and Wolf, (2013) expressed that m-learning is not only the learning that is based on the use of mobile devices but also the learning that is mediated across multiple contexts using portable mobile devices. M-learning help students and educators to perform their daily tasks using small technological devices (tablets or smartphones) anywhere anytime.

Mobile learning is considered the next generation of e-learning using mobile technologies. Students' awareness of such technologies is one of the main focuses for successful adoption (Naji *et al.*, 2011). Mobile learning implementation depends on the availability of m-learning technologies, user's awareness and perception of such technologies. In other words, availability of m-learning technologies is a pre-condition for achieving better educational outcome in the adoption of such technologies for teaching and learning processes which makes it possible for all category of learners (slow, moderate and fast learners) to be carried along (Bradley *et al.*, 2010). The Horizon report by Adams *et al.* (2015), lay emphasis on the need of educationists to review educational scenarios, making them more flexible and adapting them to digital technologies by adopting technology acceptance model.

Technology Acceptance Model (TAM) by Davis (1989), is one of the commonly used framework in studies that predict and explained the use of technologies and technology application in education settings. The TAM affirms that the adoption of technology is pre-determined by the user's awareness and perception and intention to use such technology, which is been influenced by his/her attitude towards that technology. The attitudinal and behavioral construct of a user towards a particular technological tool, depends greatly on

the user's awareness and perception of that tool which can be traced to the user's perceived usefulness (PU) and perceived ease of use (PEU) of the technological tool (Davis, 1989).

Perceived Usefulness (PU) is described as the extent to which the users of a technology perceived that the technology will augment and improve their teaching and learning process (Oldham & Da Silva, 2015). The TAM also assumes that the adoption and use of a particular technology is motivated by the behavioral intention. Nonetheless, the behavioral intention is motivated by user's attitude towards the use of the technology, and the user's attitude is pre-influenced by the user's awareness and perception of such technology. Perceived Ease of Use (PEU) is described as the level to which a user considered the use of a particular technology to be easy to operate (Davis, 1989). The concept of PEU accounts for the level at which a user accepts the fact that a particular technology would not be difficult to handle.

There are several studies about attitudes of higher education students towards mobile learning which consider it as a significant factor to understand what makes end users accept or resist mobile learning. Some international studies reveal that university students generally have a positive attitude towards the use of mobile devices in education and mobile learning (Al-Fahad, 2009; Baya'a & Daher, 2009; Hwang & Chang, 2011; Liaw & Huang, 2015; Ozdamli & Uzunboylu, 2015; Yang, 2012). Studies conducted in Turkey also indicate a positive attitude towards mobile learning (example; Kukul *et al.*, 2015). Another recent study by Elcicek and Bahceci (2015) reveal a positive attitude towards mobile learning by students enrolled on a two-year associate degree program. Sarac (2014) also concludes highly positive attitudes by candidate instructional technologists towards mobile learning as a new learning platform. There are few studies in the national literature

conducted with participation from students enrolled in computer science departments. One reason for this might be an impression that their attitude towards mobile learning will naturally be positive.

The nature of Higher Education has changed due to the rapid development of mobile computing devices and internet capabilities\connectivity (Liaw *et al.*, 2010). A survey by the (Educause Center for Applied Research [ECAR], 2012) on the use of mobile technology in higher education environments indicated that students are currently leading the implementation of mobile technological devices into their classrooms. Moreover, 67% of the surveyed students expressed that mobile technologies are very essential in their academic achievements and activities. Gikas and Grant (2013) have indicated that mobile technology has become an integral part of the educational process at the higher educational institutions as it brings many opportunities and challenges to both students and academics. Mobile learning has gained tremendous attention in academia, industry, and governments due to the unique enabling and affordable learning and teaching environment that can facilitate education for all and for all levels of education systems (Bradshaw, 2012). Mobile learning has been used extensively in academia, and a number of schools and higher institutions are increasingly adopting it to offer varying instructional services despite the challenges affecting the adoption of technology in education. We have witnessed a number of initiatives to incorporate mobile devices and applications to learning. The application of mobile devices and related technologies had increased significantly in the recent years because of their capabilities of use in many fields.

The use of devices such as mobile phones, smartphones, and personal digital assistant (PDA) have found their way into the educational sector. In addition, students and teachers

in the universities and other education institutions around the world are increasingly using mobile technology to access learning materials, internet access and facilitate learning in new and innovative ways “United Nations Educational, Scientific and Cultural Organization” (UNESCO, 2011). M-learning is the next form of e-learning that support learning anywhere and at anytime which depends on communication technologies such as global system for mobile (GSM), wireless application protocol (WAP), general packet radio service (GPRS) and Bluetooth. Over the past few years the number of studies has increased on the adoption of m-learning in many countries such as USA, Asia, Britain, Scandinavia, and Australia (Andrew & Elaine, 2007). University of Florida supports the idea of using m-learning through providing access to fast wireless network using mobile devices on campus (Cisco, 2012). Thus, the utilization of m-Learning technologies offers benefits to both students and educational institutions involved (Hoffmann & Miner, 2009). In addition, they pointed out that more focus should be directed towards the importance of m-learning and its uses among universities students because it provides many services at any time, any place. Therefore, higher education institutions must plan in future to provide a more flexible learning environment to meet the needs of new generations of students who are increasingly attracted towards mobile technologies. Nowadays, Mobile technology is being used progressively in many sectors; especially in education. Time should be invested in acquiring more information about M-learning technology before it is being implemented for educational purposes. That is, researchers should examine how the users would react to the e-assessment using the M-learning technology. A study by Wong *et al.* (2006) conducted a research that was intended to solve the problems of assessment in students’ attitude while using the smartphones for assessment. This is implemented by conducting a

trial and survey to determine the prototype that consists of experienced specialists in assessments. The survey was based on "Ease of Use", "Satisfaction", "Value", and "length of assessment". The increased usage of smartphones has made it necessary that mobile communication equipment like mobile phones and PDAs are observed in details before being used for assessments of the students' in institutions.

Students usually have to follow their teachers' strict traditional teaching methods such as imitation, recollection and oral repetition practice (Ou, 2015). Thus, students may become too passive in class if specific directions provided to them are latent or delayed, or if the teacher is "not in charge" or "not involved" in the learning activity. UNESCO, 2010, "Mobile learning is part of a new learning landscape created by the availability of technologies supporting flexible, accessible, personalized education. According to Chu and Nakamura (2010), students tend to be passive and silent in the classroom and sometimes resistant to speak out. Reason been that: they are used to being given step-by-step guidance for tasks and assignments. This learning habit seems to be suitable to the current research on the use of mobile devices in the classroom such as Personal Digital Assistants PDAs (Shih *et al.*, 2010), blogging (Huang *et al.*, 2009), and Applications development (Ou, 2015). For example, Hwang and Chang (2011), conducted a study which included the creation of a PDA, aiming to support the teaching of social science to 33 elementary school students. After an 80-minute class session to provide the course orientation to the students by bringing them to the library to find learning materials, these students were satisfied with the use of the PDAs because they could take advantage of their living environment, which allowed their cognitive learning to improve significantly.

Information and Communication Technologies (ICTs) are effective tools for improving knowledge and skills. Oliver (2002), asserted that the use of ICT in higher education enhances student-centered learning. Therefore, ICT tools are necessary for quality education in Nigerian Tertiary institutions because it helps to accelerate the learning process, increase teachers efficiency, effectiveness and provide remedial instruction and enriches material, thereby, guaranteeing higher quality standards in schools (Osakwe, 2012).

The evolution of handheld portable devices and wireless technologies has resulted in major changes in the social and economic lifestyles of society. Today, many technological devices are produced in portable form and people have become accustomed to them. These devices are reshaping user behavior in their daily lives in different ways. The impact of computers and internet is seen in the education area. As a result, educators have started looking at ways in which this technology can be used to enhance the learning experiences. After the initial impact of computers and their applications in education, the introduction of e-learning and m-learning characterized the constant transformations occurring in education.

## **1.2 Statement of the Research Problem**

The importance of ICT in education cannot be over emphasized. Efforts to integrate Technologies in Education in the 21<sup>st</sup> Century, is characterized by Information Communication Technology ICT tools, learning techniques are expected to shift from Teachers-centered to Learners-centered (Naji *et al.*, 2011). Most developed countries have taken advantage of the available educational technology tools to transform their teaching-



learning process to learner-centered. Example; Use of Computers, Smartphones, Digital Versatile Disc (DVD), Projectors, Interactive softwares, Mobile Phones and many more. These tools make the whole learning process more efficient and effective.

For instance, the period of Covid-19 pandemic have shown how important the adoption of mobile learning in education is. During the pandemic, movement was restricted and schools shut down thereby forcing learning process to shift from the Conventional classroom method to online classes. While schools activities were completely halted in most under-developed countries, the developed countries took advantages of the available ICTs like: smartphones, tablets, interactive softwares, computers, and many more to ensure the continuity of teaching and learning in order to avoid total suspension of academic activities.

One of the main reasons that are attributed to the poor usage of m-learning technology is the lack of sufficient studies that explore the factors that influence m-learning acceptance in the higher education institutions. Unfortunately, schools in Nigeria are yet to extensively exploit the technological tools for enhancing learning process. Majority of schools in Nigeria still use the conventional (talk and chalkboard method). This conventional method keeps learner passive in the classroom, thus affecting their academic performance, and obviously not preparing them for the information age and globalization. The popularity of mobile devices has increasingly becomes significant as many learners are using mobile technology in their learning environment (Bradshaw, 2012). Lecturing is still the most widespread form of classroom instruction in higher Education. Lecture with a large audience provides a problematic situation since only one or at most a few learners are able to interact with the lecturer at a given moment.

The current way of learning is only at specific place and time; learners can not easily access learning materials, assignments and sample quizzes from wherever they are and whenever they want. A fundamental problem in conventional learning is; it requires about 1 to 2 hours of continuous attention of the students, but usually the attention span of the learners is only about 20 to 30 minutes. M-learning technologies are the current technologies that can be used to resolve the above challenges of learning in the education system. A better understanding of the students' requirements will help the decision maker to adopt m-learning successfully. Thus, leads to carrying out this study on awareness, perception, and attitude of undergraduate pre-service teachers' towards the use of mobile technologies for learning purposes in Niger State.

### **1.3 Aim and Objectives of the Study**

The aim of this study was to investigate the awareness, perception and attitude of undergraduate pre-service teachers on the use of mobile learning technologies for learning purposes in Niger State. The objectives of the study include:

- i. Determine undergraduate pre-service teachers' awareness towards the use of mobile technologies for learning purposes;
- ii. Determine undergraduate pre-service teachers' perception on the use of mobile technologies for learning purposes;
- iii. Determine undergraduate pre-service teachers' attitude towards the use of mobile technologies for learning purposes;
- iv. Determine the difference between male and female undergraduate pre-service teachers' awareness towards the use mobile technologies for learning purposes;

- v. Determine the difference between male and female undergraduate pre-service teachers' perception on the use of mobile technologies for learning purposes; and
- vi. Determine the difference between male and female undergraduate pre-service teachers' attitude towards the use of mobile technologies for learning purposes.

#### **1.4 Research Questions**

The following research questions were formulated to guide the study:

1. What is the awareness of undergraduate pre-service teachers towards the use of mobile technologies for learning purposes in Niger State?
2. What is the perception of undergraduate pre-service teachers on the use of mobile technologies for learning purposes in Niger State?
3. What is the attitude of undergraduate pre-service teachers towards the use of mobile technologies for learning purposes in Niger State?
4. What is the difference between male and female undergraduate pre-service teachers' awareness towards the use of mobile technologies for learning purposes?
5. What is the difference between male and female undergraduate pre-service teachers' perception on the use of mobile technologies for learning purposes?
6. What is the difference between male and female undergraduate pre-service teachers' attitude towards the use of mobile technologies for learning purposes?

## **1.5 Research Hypotheses**

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

HO<sub>1</sub>: There is no significant difference between male and female undergraduate pre-service teachers' awareness towards the use of mobile technologies for learning purposes.

HO<sub>2</sub>: There is no significant difference between male and female undergraduate pre-service teachers' perception on the use of mobile technologies for learning purposes.

HO<sub>3</sub>: There is no significance difference between male and female undergraduate pre-service teachers' attitude towards the use of mobile technologies for learning purposes.

## **1.6 Significance of the Study**

At the end of this research work, the finding of this study is expected to be significant the following group of people: students, teachers, educational administrators, parents, non-governmental organizations, and government.

Students are expected to develop technologically and their creative and manipulative skills will be sharpen, Thus encouraging them in individualized and collective study through enquiry and discovery method.

Teachers; result of this study will provide groundwork for the teachers to know the importance relevance of educational technologies, and integrating them into teaching and learning

Educational administrators; they are also in a better position to organize a better and profound workshop geared towards proper and effective utilization of educational technologies for staffs and teacher.

Parents; are expected to be encouraged to buy for their children the necessary educational technologies.

Non-governmental organization; will come to the help of schools by training the staffs and providing of technological facilities to help better education outcomes.

Government; it is expected that the policy makers will increase efforts towards the provision of adequate technological facilities in the school laboratories which will enable the teachers and students to view abstract topics in teaching and learning.

### **1.7 Scope of the Study**

This study: awareness, perception, and attitude of undergraduate pre-service teachers on the use of mobile learning technologies for learning purposes in Niger State. The institutions that offer education courses at first degree level in the state were used for this study, these institutions include; Federal University of Technology (FUT) Minna, Ibrahim Badamasi Babangida University (IBBU) Lapai, and Usman Danfodio University Sokoto's (UDUSOK) affiliated degree studies in Niger State College of Education (COE) Minna. Students from the faculty/school of education in the schools were used in the study. The study consists of three dependent variables (awareness, perception and attitude), one independent variable (mobile technologies), and gender as the demographic variable. The study lasted between four weeks (4 weeks).

## 1.8 Operational Definition of Terms

The following terms are operationally define as used in the study

**Awareness:** the process of becoming aware of the existence of mobile technologies, to have heard or know that mobile technologies exist.

**Perception:** to understand the nature of the mobile technologies (how easy it operates and functions).

**Attitude:** the behavioral intention (reaction), or the acceptance of mobile technologies.

**Mobile Technology;** these are technological gadgets that are mobile (portable and can be carry around) and also can be used for learning purposes.

**Information and Communication Technologies (ICT):** wide range of technologies that are used by electronic means in the attainment, processing, transmission, circulation and storage of information in form of text, audio, graphics and video to create educational resources.

**Tertiary Institutions:** Education institutions where post-secondary students are trained and equipped with skills and values needed to work in the society.

## **CHAPTER TWO**

### **2.0 LITERATURE REVIEW**

#### **2.1 Conceptual Framework**

##### **2.1.1 Concept of information and communication technology**

Information and Communication Technology' (ICT) first appeared in the mid-1980s and was defined as “All kinds of electronic systems used for broadcasting telecommunications and mediated communications”, with examples including personal computers, video games, cell phones, internet, and electronic payment systems and computer etc. ICT is the digital processing and utilization of information by the use of electronic computers. It comprises the storage, retrieval, conversion and transmission of information (Ifueko, 2011).

ICTs are often spoken of in a particular context, such as ICTs in education, health care, or libraries. The term is somewhat more common outside of the United States. The ICT is made of computer and communication technology. The computer technology is the tool for storing and processing information in digital form while communication technology helps us to transfer and disseminate digital information. Communication Technology is the

process of sending, receiving and exchanging information through network systems with the help of IT and CT. Any information can be exchanged from anywhere and anytime without any borders. This information exchange is possible through LAN, expanding and connecting to other networks globally. According to the Encyclopedia of Computer Science, “Information Communication Technology (ICT) is an imprecise term frequently applied to broad areas of activities and technologies associated with the use of computers and communications”. According to UNESCO “ICT is a scientific, technological and engineering discipline and management techniques used in handling information and application and association with social, economical and cultural matters”. Information and communication technologies (ICTs), is the application of computers and other technologies to the acquisition, organization, storage, retrieval, and dissemination of information (Gulbahar, 2008). However, in this context, information and communication technology is the use of electronic devices such as computers, telephones, internet, and satellite system, to store, retrieve and disseminate information in the form of data, text image and others. American Library Association (1983), defined information communication technology (ICT) as the application of computers and other technologies to the acquisition, organization, storage, retrieval, and dissemination of information. The computers are used to process and store data, while telecommunication technology provides information communication tools, which make it possible for users to access databases and link them with other computer networks at different locations. According to Krohmer and Budke (2018), Information and Communication Technologies can be split into three components namely the technology part; information that the technology helps to deliver; and a



communication process that the technology facilitates and serves as a medium for the information.

### **2.1.2 Concept of ICT in education**

Nigeria, as one of the developing countries in the world, should prepare its citizens for the information revolution. Technology is improving so rapidly that a lot of current professions will become extinct in about 10-15 years. Therefore ICT education in Nigeria should be a priority to the government. Still, it is important to know the advantages and disadvantages of ICT education.

Information and Communication Technology (ICT) in education is the mode of education that use information and communications technology to support, enhance, and optimize the delivery of information. Smaldino *et al.* (2008) stated that in education, ICTs can be used to aid management and administrative activities, as an object of instruction for teaching and instructional purposes. Using ICT as an object of instruction consists of learning to acquire knowledge and skills to cope with challenges in educational system. Using ICT for teaching and instructional purposes focuses on the use of it to acquire an integrated set of knowledge and skills useful for dissemination of information in educational system and to effectively perform in the world of academic.

Worldwide research has shown that ICT can lead to an improved student learning and better teaching methods. A report made by the National Institute of Multimedia Education in Japan, proved that an increase in the use of ICT in education with integrating technology to the curriculum has a significant and positive impact on students' achievements. The results specifically showed that the students who are continuously exposed to technology

through education has better ‘knowledge’, presentation skills, innovative capabilities, and are ready to take more efforts into learning as compared to their counterparts.

The Mobile learning (m -learning) as a form of e -learning is a rising trend where the education has outgrown the physical constraints of the classrooms and acquired mobility. Student’s access information whenever and wherever they want, and institutions that provides such advanced technological terrains is rising in number day by day.

### **2.1.2.1 Advantages of ICT in education**

ICT is a universal tool for the globalization. Students of developed countries can’t imagine their life without ICT. Moreover, it also serves as an assistant for teacher all around the world. It’s impossible to imagine a modern professional without basic knowledge of ICT. Furthermore, it’s impossible to compete on the globe without knowing the basics of ICT. Here are five basic advantages of ICT in education:

#### **1. Fast Communication Factor**

The modern technologies illuminate all geographical boundaries, so students can join various projects all around the world. It is also possible to learn about new cultures and languages without leaving your home! It is like a science fiction that has become a reality. Students can exchange files between each other at fantastic speed with no limits on space!

#### **2. Motivating Factor**

Young people are very drawn to technology news. Educators must use technology tools in their lectures to keep the attention of young students. Any new technology opens new possibilities for teaching! For instance, the internet has opened great possibilities for innovative ways and methods of studying.

### **3. Cooperative Factor**

The chance of cooperative learning made available via ICT encourages dialog between students! They can also learn about the ideas of collaboration from the internet. It makes teachers' jobs easier as they can approach their students with the help of modern technologies. Same thing applies to the teachers, they can share knowledge or facts about their students and monitor the overall progress in a classroom via ICT!

### **4. Research Factor**

It is obvious that with internet and modern technologies, it has become ineffective to make any kind of research in libraries alone. The internet is an open world to the diverse types of knowledge for students. With the vast number of tools open to them, the internet is impossible to resist! That is why a teacher should help students find materials for their research papers!

### **5. New Skills Factor**

A student can acquire any kind of skill with the use of technology, for example, by simply watching self-education videos on YouTube, you can acquire many new skills. They can also learn new languages using modern technologies without having any teacher around them! When they know the basics, it is even possible to use their skills right away!

#### **2.1.3 Concept of mobile learning**

##### **What is Mobile Learning?**

Mobile learning is a broad term that refers to the process of learning via the internet or network using personal mobile devices such as smartphones, tablets, laptops. And digital notebooks (Pedro *et al.*, 2018). Mobile learning, also called m-learning, is education or training that is conducted on and delivered through portable devices like smartphones and

tablets. O'Malley *et al.* (2014) have defined mobile learning as learning taking place when the learner is not at a fixed, predetermined location, or when the learner takes advantage of the learning opportunities offered by mobile technologies. According to Traxler, (2007), mobile learning also covers the delivery and support of learning using mobile 'phones and any other mobile devices'. According to a UNESCO report (2010), mobile devices include any portable, connected technology, such as basic mobile phone, smartphones, e-readers, netbooks, tablets, iPads and computers. Prensky (20048, points out that today students have not just changed incrementally when compared to those of the past. They are the first generation to grow up with electric devices of new technology. He adds that they have been using videogames, video cams, digital music players, cell phones, computers, and all other toys and tools of the digital age almost from their birth and are an essential part of their lives. He further says that today, mobile learning is a need but not a want. It is believed that by allowing students to use mobile devices in the classroom, motivation to learn and to achieve increases (Kunzler, 2011).

#### **2.1.3.1 Features of mobile learning/m-learning:**

1. Portability.
2. Flexibility (It is convenient to access anywhere, any time).
3. Engaging and fun.
4. Light weight when compared to books, PCs, etc.
5. Wireless technology (Wi-Fi, Bluetooth, infra port).
6. Enable access to the resources in different formats (Video, Text, and Voice).

7. Collaborative

8. Enable learners to construct understanding.

9. Low Cost.

#### **2.1.3.2 Advantages of mobile learning/m-learning:**

1. Interaction: Students can interact with each other and instructor easily.

2. Increases motivation: Helps the reader to read more.

3. Internet access anywhere so reader can read any time.

4. Just-In-time learning: Increases work/learning performance.

5. Learners can individually control their speed of reading.

6. Possible to share assignments and notes through e-mails, Bluetooth, etc.

7. Improves reading and Communication skill.

8. Engaging learners: New mode learning engages many to read through mobile, PDAs, etc.

9. Autonomy: It provides students more independent and flexible in distance education.

#### **2.1.3.3 M-Learning technology**

Technology Support for Mobile Learning/mLearning can be generally listed as follows

1. **SMS** (Short Message Service).

2. **MMS** (Multimedia Messaging Service).

3. **WAP** (Wireless Application Protocol) allow the user to access internet via their WAP enabled in mobile phones.
4. **Bluetooth**: A short range wireless connection, this enables PDAs (Personal Digital Assistants) to pass messages to and from other mobile devices.
5. **PDAs** (Personal Digital Assistants) evolved to mini PCs able to carry out many of the basic functions of a larger PCs using Palm OS and MS Pocket PC operating system.
6. **MP3s**: Audio file format that compresses the file and enables to share.
7. **Cams**: Video cameras now embedded into mobile phone and PDAs.
8. **GPRS** (General Packet Radio Service) an internet connection for mobile device that provide greater speed of connection.

Major Technologies Used in Mobile Learning/mLearning: Mobile Phones/Smartphones, PDAs (Personal Digital Assistants), Laptops/Tablet PCs, MP3 Player, Ipod.

Furthermore, these technologies can be grouped into significant technologies that should be utilized to manage the learning experience for mobile learners. These technologies can be divided into three categories.

1. Mobile devices
2. Technologies to deliver the learning content which are the wireless technologies that permit the connectivity of mobile devices to enable the learner to access any content on the Internet and some other communication technologies.
3. Technologies to develop the learning content

#### **2.1.3.4 Mobile devices**

Gadgets that can be used in portable learning must accomplish two key prerequisites, which are; the capacity to convey the learning substance and the capacity to backing the learner versatility. As per these necessities, cell phones can be the best innovations that can be use in versatile learning. In Trifonova *et al.* (2006), the creator characterize cell phones as "PDA, advanced wireless and for the most part cell phones can be any gadget that is little, self-ruling, and sufficiently subtle to go with us in every snippet of our consistently life, and that can be utilized as a part of learning".

Also, cell phones ought to be sufficiently little to fit in the client pocket, and they ought to be conveyed by the client in a routine manner. For that, laptops and journal machines are excluded in cell phones on the grounds that they are convenient however they are not versatile (Caudill, 2007). Be that as it may, the principle classes of cell phones are; PDA, cells, Pdas and non-telephony cell phones.

### **2.1.3.5 Technologies for delivery of learning contents**

#### **1. Wireless Technologies**

Despite the cell phone's abilities, no cell phone can convey learning material to learners in the event that it doesn't have a right to gain entrance to internet learning materials. Over the previous years, Internet has been viewed as a successful device that can be utilized for training purposes. Therefore, next, we will show a percentage of the paramount remote correspondence innovations that are utilized to permit cell phones to join with the Internet in versatile learning environment and they can be arranged into remote telecom advances and remote neighborhood and individual region organizing.

In the accompanying rundown, we are going to for the most part depict a portion of the fundamental remote telecom innovations, for example, GSM, GPRS/EDGE, UMTS and WAP.

A. Worldwide System for Mobile Communication (GSM) (GSMA): GSM is a boundless standard that is been utilized for the computerized cell correspondence. GSM has a 9.6 Kbps information exchange rate. Besides, it offers numerous preferences to the mobile phone clients, for example, upgrading the nature of voice and offering the short message administration (SMS) which is a modest way that permit the clients to correspond with one another. Furthermore, through GSM the client can utilize his telephone everywhere throughout the world utilizing the wandering administrations.

B. General Packet Radio Service (GPRS)/ Enhanced Data Rates for Global Evolution (EDGE): GPRS is an engineering that permits a pervasive portable information administration which has a higher information exchange rate than GSM, roughly somewhere around 30 and 80 Kbps. GPRS as the name demonstrates relies on upon the bundle exchanged approach in exchanging the information and it is the most usually utilized and accessible remote engineering. It offers the client the capacity to peruse the Internet and check email moving. In any case, a few clients have the capacity get quicker web integration paces utilizing the EDGE innovation, which additionally called EGPRS, in light of the fact that it overhauls the GPRS engineering (Alzaza, 2012).

C. Widespread Mobile Telecommunications System (UMTS): UMTS is correspondence engineering that focused around GSM and was first propose in Europe. The high information exchange rate of UMTS, which is 2mbps, makes this innovation suitable for



exchanging a lot of information, film downloads and feature conferencing. As GPRS, UMTS relies on upon the parcel exchanged approach in exchanging the information yet it is more extravagant than GPRS.

D. Remote Application Protocol (WAP): WAP is a convention that was outline to permit the clients to scan the Internet from their cell phone instead of searching the Internet from a desktop machine. In addition, this convention can see the data that is composed by Wireless Markup Language (WML), which is really gotten from the Extensible Markup Language (XML).

E. Irda, Bluetooth, and 802.11 are the most recognizable remote neighborhood and individual region organizing advances.

## 2. Other Communication Technologies

### A. Short Message System (SMS)

SMS is the office to send and get little measures of alphanumeric messages that can incorporate numbers or images starting with one cell phone then onto the next. In versatile learning, SMS can assume a part in transmitting restricted vital data for the learners and the guides, for example, advertising the exams plan or the assignments due dates.

### B. Media Message System (MMS)

MMS that is relative of SMS is utilization to empower the clients to send and get one or more media messages, for example, advanced photographs, illustrations, feature cuts and sounds through cell phones. In portable learning, MMS can be use for instance to transmit

charts and assumes that can condense some fundamental thoughts that were represented in the learning materials for the learners.

### **2.1.3.6 Technologies for developing learning contents**

We divide the technologies that are use to develop the learning content into three categories, which are; technologies to create the content, technologies to store the content, and technologies that are used to manage the content.

#### **1. Technologies to Create the Content**

We have mentioned the major technologies that can be used to create the learning content which is usually written by the HTML such as the web authoring tools, course authoring tools, content converters and many other technologies. In mobile learning, the content can be written by different Markup language such as XML and WML and as a result, there are many authoring tools that are developed especially for these languages such as XML authoring tools.

#### **2. Technologies to Store the Content**

As in e-learning, mobile learning content is stored as elements in the database or files in a file structure that can be static with no functions or dynamic with functions such as automating indexing, classification and filtering. Moreover, there are some effective solutions as Microsoft Content Management Server that provide database and file structure storage with some useful functionalities including filtering, indexing, classification, search-routines, and content streaming facilities.

#### **3. Technologies to Manage the Content**

The learning content in mobile learning is managed by the same tools that are used to manage the e-learning content which includes:

Content Management System (CMS) which is an integrated system that are used to create, manage, and deliver the learning content.

Learning Management System (LMS) as mentioned before offers several functionalities designed to administrate the learning process by managing the students' information, tracking students' progress, and delivering the learning content.

Learning Content Management System (LCMS) as mentioned before are used to manage the higher educational learning content itself. It enables the tutor to create a different format of the learning content. Moreover, it provides functionalities such as storing, searching, retrieving, and reusing the learning content. Finally, it can hold up asynchronous collaborative learning and it can be used to customize the learning process to fit the learner's preferences.

#### **2.1.4 Awareness of undergraduate pre-service teachers towards mobile technologies**

The introduction of digital technologies in the education process is a theme that spans the literature on Education Technology since the 1980s (Pedro *et al.*, 2018). Highly associated with the emergence and consensual acceptance of new pedagogies and a renewed epistemological approach about the nature of knowledge and of its construction, technologies are often depicted as a set of tools that bear in themselves several solutions to the problem of education. The optimistic view of digital technology came about with the introduction of personal computer, then internet mainly in the 1990s and is still echoed and very much amplified with the possibilities brought by the pervasive and ubiquitous access to mobile devices and social media platforms in the 2000s. These latter devices and media

frame the emergence of a new learning modality, mobile learning (m-learning) through the use of mobile technologies like phones, laptops, MP3 players etc.

### **2.1.5 Perception of undergraduate pre-service teachers' mobile technologies**

Mobile technologies integration in education and learning practices of undergraduate pre-service teachers is a complex and challenging issue. In this regard, Gülbahar, (2008) identified that just equipping schools with the essential mobile technology tools does not improve the quality of learning and does not create more effective learning environments. As a result, the Government made various attempts in the past to improve the achievement of students in schools, placing a lot of emphasis on ICTs and mobile technology as a tool for teaching and learning (MOESS, 2007). Mobile technology learning platforms gives learners fluency in varieties of representational systems, provide opportunities to create and modify representational forms, develop skills in making and exploring virtual environments, and emphasizes as a fundamental way of making sense of the world (Ang & Lee, 2005; Al-Emran & Shalaan, 2014).

In order to make use of mobile technologies in learning, the teaching competency for stimulating learners' interest in learning required pre-service teachers to use mobile technologies in their learning activities. Adams *et al.* (2015) argued that although educators appear to acknowledge the value of mobile technologies in schools, difficulties continue to be encountered during the process of adopting these technologies for their purposes. Due to the importance of mobile technology in the society and possibly in the future of education, identifying the possible perceptions of the integration of these technologies in schools would be an important step in improving the quality of learning.

Regarding undergraduate pre-service teachers' perceptions of the application of mobile technology in learning, Buabang-Andoh (2012), found that majority of the respondents perceived that integrating mobile technology into teaching and learning was useful and can offer opportunities to learners for obtaining educational resources from the internet to enrich learning contents and also can improve learning processes. Perception therefore, can be defined as the degree to which a user believes that a specific technology will affect his or her performances. A user of a technology system who perceives the system to be very useful will experience a positive use performance relationship. Perception is the ability to understand the true nature of something. Pre-service teachers' perception is a critical factor to consider in order to integrate mobile technology into learning process (Onyia & Onyia, 2011). When pre-service teachers have the right Perception of mobile technologies, it builds their confidence which results to success.

#### **2.1.6 Attitude of undergraduate pre-service teachers towards mobile technologies**

Teaching activity is one of the numerous professions that are faced with challenges as a result of the dynamic nature of the society. Intending teachers and teachers need help either through pre-service or in-service teacher education programs to develop their content knowledge, pedagogical skills or the realization of certain practices. Their success in teaching depends on their knowledge, attitude towards teaching, academic self-concept and explicit understanding of the profession. Teacher education provide teachers' knowledge, skills and aptitude to be familiar with the art and science of teaching that in turn gives them confidence to carry out their task. Information and Communication Technology (ICT) has galvanized the education system and brought more challenges to the teachers. Caudil (2007), noted that ICTs have become within a short time, one of the basic building blocks

of modern society. Agreeing with that, Gikas and Grant (2013), defined Information and Communication Technology (ICT) as technologies used to communicate in order to create, manage and distribute information which includes computers, the internet, telephone, television, radio and audio-visual equipment.

Haji, (2015) defined attitude as ‘a mental and neural state of readiness, organized through experience, exerting a directive or dynamic influence upon the individual’s response to all objects and situations with which it is related. Attitude is defined as a disposition of individuals for organizing thoughts, feelings and behaviors towards a psychological object and positive teacher attitudes are considered as an important predictor of successful teaching practices. If undergraduate pre-service teachers are of positive attitude towards the use of educational technological tools then they can be courageous in the integration of the mobile technology tools in the learning and learning process when fully in practice (Krohmer & Budke, 2018).

Undergraduate pre-service teachers attitude towards the use of mobile technologies are regarded as the driving force behind their ICT use behavior in many studies (Aydin & Semerci, 2017). If undergraduate pre-service teachers show positive attitude towards mobile technologies then they can easily provide useful insights about acceptance and usage of the mobile technology tools in learning, success of learners learning through mobile technologies depends largely on their attitude towards the technological tool. The undergraduate pre-service teachers’ existing attitudes; skills and working habits will have great influence on their acceptance, style of implementation and outcome of using mobile technologies for learning (Pedro *et al.* 2018).

While technological tools are becoming prevalent in schools, and children are increasingly growing up with such tools, the use of these technological tools for teaching and learning continue to be a concern for educators (Jimoyiannis, 2010).

### **2.1.7 Gender influence in ICT usage**

ICT competence has been used by scholars in different dimension. In recent years gender studies have reflected an aspect of life which gains massive benefits from the utilization of technology. Gender differences have been recorded in terms of classroom interaction, teaching practice, skills acquisition, information literacy behavior, professional development and reading habits (Funmilayo, 2013). Gender is an enduring characteristic of undergraduate pre-service teachers that stands as an important variable which could produce differences in individuals. Gender is intertwined with identity, expression, presentation, relationships and societal role and structure, among other things. As noted by the United Nations (2008) gender refers to the social attributes and opportunities associated with being male and female and the relationships between women and men and girls and boys, as well as the relations between women and those between men. Gender determines what is expected, allowed and valued in a women or a man in a given context. In most societies there are differences and inequalities between women and men in responsibilities assigned, activities undertaken, access to and control over resources, as well as decision-making opportunities. These differences and inequalities are present in the education sector and it also affects the use of mobile technologies and other ICT tools.

In addition, studies have established that girls are less confident than boys in their computer skills, and that some international studies have found that boys scored better than girls in computer related knowledge and skills in vast majority of countries. In addition, the three

computers related occupation (computer science, computer engineering and system analysis) are the top career choices for boys (Sarac, 2014). Females also have more negative attitude towards computer (Mustafa & Mustafa, 2018). The study thus confirmed the view of gender and competence as actively constructed in a social process. This is because understanding of the terms was negotiated among individuals in the groups studied, and therefore, used as norms with which individuals understood themselves and their behaviors. This will in turn negatively affect the awareness, perception, attitude of undergraduate pre-service teachers in such societies.

The gender gap is a critical challenge that threatens to leave millions of women and girls behind in an increasingly globally connected world (Adediran *et al.*, 2013). This is to promote gender equality and empower women. This should commence with the elimination of gender disparity in lower levels of education. Only when this gender gap is bridged, will the full potential of both male and female pre-service teachers in using ICT for electronic teaching be harnessed.

## **2.2 Theoretical Framework**

Contemporary trends in communication and wireless technologies have resulted in the proliferation of mobile devices. For instance, cell phones and Personal Digital Assistants (PDAs). In addition, scientific investigations have equally offered significant insights into mobile learning despite the issue being a relatively new phenomenon with its theoretical premise yet to become extensive. Further, instructional designers have been given the needed support to consider the role that mobile devices, as instructional materials, play in how students go about the process of learning. This encouragement has been necessitated



by the rationale of thought that students' attempt to learn, may be associated with their skills and experiences of becoming proficient with the use of various forms of mobile technology.

In this study, I will briefly present the theoretical approach and the models used in mobile learning at the higher education level. My main subject of discussion brings to focus, Ausubel's Theory of Cognitive Learning which is used as the theoretical framework which offers a lens for investigating how information is absorbed, processed, and retained during learning in the university setting. Emphasis will be placed on how students integrate new knowledge with what they have already learned or what they already know. Thus, the Theory of Cognitive Learning by Ausubel (1968); Ausubel *et al.* (1978) is aimed at analyzing how students perceive or become conscious of the use of laptop, smartphone and tablet computers in teaching-studying-learning processes. The Teaching and Meaningful Learning (TML) and the Enhanced Teaching and Meaningful e-Learning (ETMeL) models expatiate on students' learning processes and their learning outcomes with pedagogical possibilities afforded by the three mobile computing devices. Invariably, the models discuss the rate of educational use of mobile technology by university students, how students' use of mobile computing devices has promoted their learning, as well as the amount of hindrance that is associated with the use of mobile technology in higher education learning.

Last but not least, it is the hope that learners may bring their intuitive beliefs and experiences about mobile technology in relation to new concepts to attain the desired objectives of meaningful learning, for it is quite reinvigorating to learn that in recent times, a number of studies have been endeavored by researchers (Karppinen, 2005; Rendas *et al.*,

2006; Rick & Weber, 2010) to apply information technologies to support the achievement of meaningful learning through mobile learning (Huang *et al.*, 2011).

### **2.2.1 Theory of cognitive learning**

One of the most prominent results of recent research in cognitive psychology is taking cognizance of the claim that ‘old’ knowledge plays a fundamental role in the acquisition of ‘new’ knowledge (Pieters *et al.*, 2015). The theory of cognitive learning (Ausubel, 1963, 1968; Ausubel *et al.*, 1978) is analyzed from the aspect of educational psychology where the centre of interest is on how students learn. The theory is based on the ideas that learners learn through meaningful learning, and not through rote memorization. In the theory, Ausubel contends that meaningful learning is accomplished by prior knowledge. That is, any new learning must, in some fashion, connect with what learners already know. Students’ prior knowledge provides proof of both the alternative and technological conceptions that learners possess. Because of this, students’ learning is basically affected by their existing knowledge prior to instruction (Hewson & Hewson, 1983).

In Ausubel *et al.* (1978) cognitive learning theory, they demonstrate the importance of meaningful learning process as being dependent on the abilities of learners to relate new concepts to what they (the learners) are familiar with or are already used to. The theory also states that the most important factor influencing learning is the quantity, clarity and organization of the learner’s present knowledge. This present knowledge consists of facts, concepts, theories, and propositions that the learner has the right or opportunity to use or benefit from. As a matter of fact, present knowledge comprises the learner’s cognitive structure (Ausubel, 1968). Further supported, the quantity and quality of the knowledge

structures that learners build, will determine their ability to transfer this knowledge for use in new contexts (Alexapolou & Driver, 1996; Basconas & Novak, 1985). Consequently, the theory explains that the construction of new meanings requires that learners attempt to achieve the integration of new knowledge with existing relevant concepts and propositions in their cognitive structure. These propositions are seen as essential elements in representing meanings. In addition, being the basic mental process that learners use to make sense of information, the cognitive structure is greatly determined by how much effort is made to seek this integration (Novak, 2002).

In the context of higher education learning, familiarity with some technological devices in pedagogy and student learning allows students to apply their computer and technological skills in not only problem solving cases but also in the teaching-studying-learning processes (Cradler *et al.*, 2002). Again, since students are used to exploiting the technological resources in and around the university, they are capable of being motivated and having the confidence in the utilization of these technology (computers) to enhance and support new instructions such that their experiences of using technological devices to improve their learning at the higher education level can be ascertained. Also, the integration of new knowledge with students' current knowledge of mobile devices, can help them to explore more, especially when new learning opportunities are provided them (Salmon, 2015).

Besides, meaningful learning gives prominence to the acquisition of new information by learners and their connections to previous experiences and knowledge in the formation of personal and unique understandings (Rendas *et al.*, 2006; Viola *et al.*, 2007). It is the belief of the researcher that every university student concerned in this research owns at least one

of the mobile technologies mentioned in the study. That being so, having the particular device or devices in their possession anytime, anywhere, spot on, creates a familiar bond in such a way that incorporating new knowledge in connection with their course work ensures the achievement of a meaningful learning process. As suggested, when learning materials are well organized with new ideas and concepts that are potentially meaningful to the learner, anchoring new concepts into the learner's already existing cognitive structure will make the new concept recallable. In other words, the theory explains that before new materials can be presented effectively, the student's cognitive structure (the area that is prepared to accept new or altered ideas) should be strengthened, and when this is carried out, acquisition and retention of new information is facilitated (Ausubel, 1968). On this account, the expectation of students' knowledge of laptop, smartphone and tablet computers for learning new things and solving studying related problems can make learners recollect the experiences they used with the devices to understand the new concept taught them.

As a re-echo, the goal of formal education should be meaningful learning (Jonassen & Strobel, 2006). In suggestion of the theme of his theory, Ausubel (1968) wrote a famous quotation in the preface of his work, 'Educational Psychology: A Cognitive View':

"If I had to reduce all of educational psychology to just one principle, I would say this: The most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly" (Dochy, 1994).

The afore-stated involves a tripartite assumption:

- That prior knowledge is an important variable in educational psychology;

- That the degree (content and degree of organization) of prior knowledge of a student must be explicit or measurable for the achievement of optimal learning; and
- A learning situation is optimal to the degree to which it accords with the level of prior knowledge (Pieters *et al.*, 2015).

These suppositions point to the idea that students with prior experience of mobile technology in a particular learning situation will be able to perceive their situation in relation to their prior experiences, thereby adopting a certain approach to learning. For instance, in participating in synchronous discussions via applications based on written communication like Facebook and Skype chats, students may become conscious of the advantages these synchronous discussions may have in the promotion of their learning. On the other hand, students may also recognize that working asynchronously with their colleagues on a common written document such as wikis and Google Docs may have promoted their learning. Therefore, all aspects of this situation will be part of the learner's awareness at all times (Prosser & Trigwell, 1999).

Not all, as a fundamental principle for instructors, teachers must take seriously what their students have already learned. As a caution, to take learning seriously, teachers need to take learners seriously (Shulman, 1999).

In addition, any pedagogically significant use of technology should enable learners to engage in meaningful learning (Jonassen, 1995). In this instance, since university students own mobile devices mentioned in this study, it can be said that they are familiar with the mobile devices and are therefore able to manipulate them to their benefits; hence their ability to operate these devices indicates their prior knowledge of mobile technology in

higher education learning. The caution though is that access alone does not guarantee that a particular programme will be successful (Salmon, 2015). Besides, the availability of mobile devices does not guarantee their use in education. Based on these reasons, we must first analyze students' readiness for mobile learning (Corbeil & Valdes-Corbeil, 2007; Keller, 2011). This, the theory explains, is where teachers need to remember that inputs to learning are crucial. Instructors therefore should ensure that learning materials are well organized and new concepts must be potentially meaningful to learners such that the new concept can be recallable (Ausubel, 1968).

The construction of new meanings requires that learners seek to integrate new knowledge with existing relevant concepts and propositions in their cognitive structure. Cognitive structures, according to Garner (2007), are the basic mental processes people use to make sense of information. While concepts are defined as perceived regularities in events or objects, a combination of these concepts form statements, otherwise known as propositions. Thus, knowledge stored in our brains comprises networks of concepts and propositions (Novak, 2002). In addition, effective teaching reinforces positive transfer by actively identifying the relevant knowledge and strengths that students bring to a learning situation where they build on them (Bransford *et al.*, 1999). It is therefore gratifying to stress that the university where the research was carried out has a strong commitment to Information Communications Technology (ICT); as a result, students have some knowledge about the use of ICTs. This explains that supported by effective teaching, students will be capable of integrating whatever new things they learn with mobile technology, in combination with their relevant knowledge of the technology. The positive transfer gained, can be discussed by way of students' perceptions of using mobile

technology in higher education learning. Furthermore, collaborating with the mobile devices as technological aids, enhances the creative and problem-solving possibilities of students. That is, students' current knowledge of mobile technology in union with being constantly connected with their fellow students through mobile devices may well promote their learning.

In buttressing the significance of the theory of cognitive learning, and therefore meaningful learning with its major influence on the world, there is no gainsaying the fact that invariably, major changes in various establishments are being compelled by world economic changes, thereby placing a premium on the capacity and worth of knowledge and new knowledge production. These changes require changes in school and university education that focus on the nature and power of meaningful learning (Novak, 2002). For the reasons adduced, the theory of cognitive learning makes it possible for teachers to provide new learning opportunities to students as well as students being able to identify some factors that might affect the successful use of mobile technology in higher education learning.

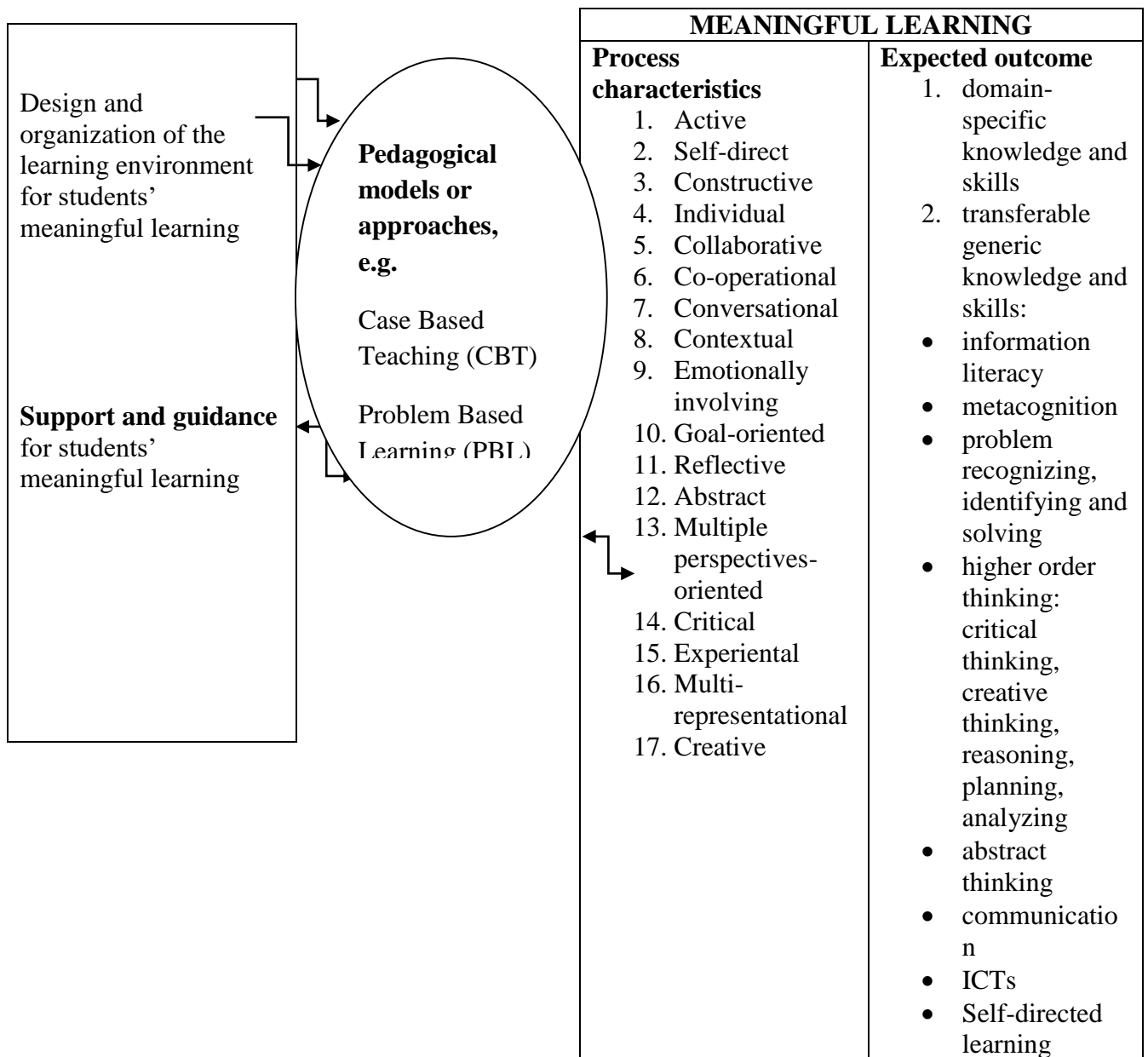
### **2.2.2 The Technology Mediated Learning Model (TML Model)**

As a general approach that can be used to shape curricula, design instructional materials, and guide instructors' work which does not only take place in the lecture rooms but equally in other settings, the TML model is a pedagogical model that exploits the use of mobile technologies in the teaching-studying-learning processes. The model is concerned with students' learning processes together with their expected outcomes. This study therefore incorporates the TML model since the significant use of mobile technology is perceived as useful for learning, facilitates both teaching and meaningful learning, as well as enhances the acquisition of domain-specific knowledge and methodological skills (Hakkarainen & Vapalahti, 2011).

The TML model is presented in Figure 2.1

<b>Teaching</b>
-----------------





**FIGURE 2.1** TML Model Source: Hakkarainen *et al.* 2009.

As Figure 2.1 indicates, a general review of the 17 characteristics of meaningful learning given by Hakkarainen *et al.* (2009) are the following:

1. **Active** – It is said that “Human learning is a naturally active, mental and social process” (Jonassen & Strobel, 2006). The belief is that whatever learners involve themselves in may have some physical evidence of ways that they (the learners) particularly act in response

to others and sometimes to certain situations. A detailed investigation and analysis of these activities that learners become involved in may help ascertain what they know. According to Prince (2004), active learning is fundamentally any instructional method that engages students in the learning process. In actual fact, this type of learning “requires students to do meaningful learning activities and think about what they are doing” since the core elements of active learning are student activity and involvement in the learning process. Learners are occupied with activities that promote good thinking abilities since students are not only encouraged to ask questions and acquire information, but also made to critically evaluate information as well as express new ideas and models of thinking (Ruokamo *et al.*, 2002).

2. **Self-directed** – In this approach, the learner is motivated to exercise personal responsibility and much independence with the decision of choosing what to learn and how to learn it (Garrison, 1997). According to Knowles (1975), self-directed learning is a “basic human competence – the ability to learn on one’s own”. Besides, it is a learning process that is extensive and occurs as part of day to day life of an adult. Aside from this learning process being methodically planned, it does not rely on a class room nor needs an instructor (Tough, 1967). Indeed, this research had respondents discussing the various degrees or levels at which mobile technology are used for study purposes outside lecture hours.

3. **Constructive** – From the constructivist’s point of view on learning, the assumption is that “knowledge is individually constructed and socially co-constructed by learners based on their interactions in the world” (Jonassen, 1995). Constructive learning therefore means learners gain new ideas into their relevant previous knowledge in a process of meaningful making but not of knowledge reception (Jonassen, 1995, Jonassen *et al.*, 2003). For

learners to meaningfully construct and reconstruct meanings, there must be the prerequisite of actively seeking to “integrate new knowledge with knowledge already in their cognitive structure” (Novak, 2002).

4. **Individual** – Individuality means that learners have personal learning methods and strategies which suggest that students’ prior knowledge, conceptions, and interest always influence learning (Ruokamo *et al.*, 2002). Indeed, for the most part, “it is the learner who must choose to learn meaningfully”. “measures of student learning” are the true barometers of the quality of teaching through technology (Hay *et al.*, 2008).

5. **Collaborative** – By collaborative learning, it refers to ways that information is presented to students. Students at various performance levels form small groups all gear towards the achievement of a common purpose. In these groupings, students are concerned with one another’s learning as well as their own (Gokhale, 1995). By this, the success of a member producing an intended result helps the other team members to be equally effective. Collaboration among learners also occurs throughout the learning process. In reality, collaboration helps in the development, testing, and evaluation of different beliefs and hypotheses within learning contexts (Jonassen *et al.*, 1995).

According to some intellectuals of collaborative learning, besides the fact that the effective exchange of ideas within small teams increases interest in teamwork, it promotes critical thinking as well. For example, there is persuasive evidence that active engagement of teamwork by students achieve higher levels of thought and they also remember information longer than students who work reservedly as individuals (Johnson & Johnson, 1999). Thus, learners also have the opportunity of taking responsibility for their own learning, thereby

becoming analytical (Totten *et al.*, 1991). Indeed, working jointly as a team makes it possible for students to have the chance to be involved in discussions.

6. **Co-operative** – It is said that “Extraordinary achievement comes from a cooperative group, not from the individualistic or competitive efforts of an isolated individual” (Johnson & Johnson, 1999). With a cooperative learning group, students team up with the fulfillment of shared goals. Beyond just discussing tasks with one another, members in the team ensure the provision of assistance to each and every member making certain that the said task is well comprehended as well.

Secondly, since in the lecture room it takes a cooperative effort, students give support to one another and get actively involved in all the learning activities. Making sure that each member is contributing and learning, individual performance is monitored along the line. In this situation, the result, according to Johnson and Johnson (1999), is that “the group is more than a sum of its parts, and all students perform higher academically than they would if they worked alone”. Further to that, cooperative learning is seen to be a student-centered, instructor-facilitated didactic strategy where small groups of students take charge of their own learning as well as all group members. With the aim of acquiring and practicing the elements of a subject matter to complete a task or achieve goals, students interact with one another (Li *et al.*, 2013).

7. **Conversational** – Conversational learning is a dialogue. That is, it is a process of internal and social negotiation (Jonassen, 1995). For learning to be effective, there must be the action of constructing an understanding that relates new experiences to existing knowledge. Most significant to this action is conversation with teachers, with other learners

including ourselves, as well as with the world in its entirety. As learners conduct experiments and explorations and interpret the results, they become empowered when they are in charge of the process thus, “actively pursuing knowledge rather than passively” (Sharples *et al.*, 2002). In conversational learning, it is important that individuals and groups formulate plans such as: reflecting on what is known, what needs to be performed, what needs to be ascertained; how capable the various plans can work successfully, as well as their potential viability, before solving any situated problems (Jonassen *et al.*, 1995). In the study, students discussed scheduling meetings with either their fellow students or with their instructors as well as how mobile devices have enabled them to receive instant feedback from them.

8. **Contextual** – This refers to a system of instruction which is based on the philosophy that students learn when meanings are discerned in an educational material and in works assigned them by their teachers when they can link new information with previous knowledge together with their own experience (Johnson *et al.*, 2011). It is also argued that contextual learning refers to “learning tasks that are situated in meaningful, real world tasks or problem-based learning environment” (Ruokamo *et al.*, 2012). Thus, context assigns meaning to content. In this situation, the more students are able to link their lessons to this context, the more meaning they will gain from them. The idea ultimately is that once students are able to discover meaning in knowledge and skills, it then leads to their mastery of them (Johnson *et al.*, 2011). Another school of thought postulate that the social and cultural background of the learner (the context) and the learning situation is explicative in the sense that learners may respond differently to an experience contingent on their identities as learners, and how they interpret a particular activity or event. In certain

scenarios for instance, learners may feel extremely capable and be ready to share their experiences as part of the learning programme, while in other situations they may feel apprehensive or perhaps even averse to the idea (Caffarella & Barnett, 1994).

9. **Emotionally involving** – There are students who perform best in a lecture room setting where the atmosphere carries a high emotional charge. For example, some classrooms may be identified with the provision of an emotionally colorful learning atmosphere. In fact, this evocative learning setting may even include the teacher’s own apparent enjoyment and participation in what is being taught. On the other hand, another emotionally involving classroom may have the teacher and students conduct active discussions or debates where dissents may be common and probably strong positions opinionated. Considering both classroom settings, the emotional tones could be observed. A comparison of the two emotionally involving settings may show the former focusing on the topic being dealt with while with the latter, the focus may be on sides taken (Fischer & Fischer, 1979). It is also reported that according to university students’ perceptions, emotional involvement is a highly important feature of a good learning environment. The relationship between the students and their academic environment has an impact on their motivation to learn (Ruokamo *et al.*, 2012).

10. **Goal-oriented** – As learning is generally considered a goal-oriented activity, more often than not teachers are assigned to involve their students in a search for meaning and how significant learning materials are. This search for meaning must be a “pleasurable experience” (Cheung, 2001). In addition, the learning materials should be something that students cannot only relate to, but also must be within their level of interest (Furlong and Maynard, 1995). In a goal-oriented learning environment, learning is achieved by means

of discovery and exploration (Prince, 2004). During this activity, students work diligently with the intention of achieving and increasing each individual's knowledge (Hakkarainen *et al.*, 2009). Further to that, members participate in a particular task with specific body of resources, goals, and orientations. They then participate and orient to the situation where certain bits of information and knowledge become significant and are therefore initiated by the group members. In a situation where goals are already established, they are reinforced. Also based on the consistence with the goals, decisions are made either being in the know or not. Again, with respect to how members make decisions also considers what directions to pursue and what resources to use (Schoenfeld, 2010). The study thus discussed the usefulness of mobile technology to students when picking up incidental ideas related to their goals of study.

11. **Reflective** – By sound judgment in practical terms, reflection lies somewhere around the notion of learning. We reflect on something in order to consider it in every respect (Moon, 2001). One major prerequisite for making meaning of new information and advancement from surface approach learning to deep approach learning is reflection. Xie *et al.* (2008) defines reflection as “a cycle of inquiry for the purpose of making meaning or finding solutions for a troubling situation or question”. Reflection therefore places an emphasis on learning by way of interrogating and exploring to lead to a development of discernment (Smyth, 1992).

Research has detected that most university students are involved in partial reflective thinking since their reflections, under normal circumstances, cease at the lower level (King & Kitchener, 1994). In view of this, various plans of actions have been intended for encouraging and promoting the reflective thinking skills of students; e.g. journal writing

and peer feedback (Xie *et al.*, 2008). Also, being an essential component of learning, reflection has been argued to be the means of integrating learning into the patterns of thought and relating it to previous knowledge, reflection on the learning process allows the learner to make a general review and acquire further understandings of oneself or the knowledge.

12. **Abstract** – By abstract, it refers to an individual’s ability to make a generalization based on previous knowledge. Basically, when something is simplified by discarding irrelevant information, it can be said a learner is abstracting or generalizing. Also, the ability to generalize from sparse data is crucial in learning, in the sense that human cognition depends on a special talent for bringing out generalized knowledge from a few specific instances (Tenenbaum *et al.*, 2006). In another context, it is postulated that abstract is the construction of new ideas at an abstract level. Further supported is the assertion that from practical experience, the development of theoretical ideas becomes deeper (Ruokamo *et al.*, 2002). In the study, students have discussed how mobile devices have been useful to them when constructing new ideas on an abstract and theoretical level.

13. **Multiple perspectives** –oriented – These sets of viewpoints, from instructors’ position, are crucial to learners since they “allow teachers to create a bridge to powerful critical literacy learning in their classrooms” (Clarke & Whitney, 2009). Alternatively, Mausfeld (2010), calls these learning perspectives ‘multiperspectivity’.

Learning occurs in many different facets, for example, in the lecture room, students have conversations with their fellow mates, and even after. It is therefore important that multiperspectivity is considered since it enables learners to think flexibly which in other



words, leads to creativity and variation. When students are able to explore content from multiperspectivity, they will become confident with complex situations that have many correct answers (Feldman, 2002). Aside from the familiarity of multiperspectivity helping learners to appreciate others' viewpoints, it also provides powerful tools for understanding how students learn through participation in the classroom (Borko, 2004).

14. **Critical** – Critical thinking in general refers to the ability to think clearly and rationally. It includes the ability to engage in reflective and independent thinking, so learners can understand the logical connections between ideas and identify, establish, and evaluate arguments. In addition, critical thinking focuses on messages that are conveyed through speech or writing. These same messages could be delivered by means of performance or through media (Ruokamo *et al.*, 2012). Thus, teachers are encouraged to resort to classroom strategies that churn out more active learners rather than passive ones on the basis of 'the global economy', which without any shred of doubt, needs "active, creative, and critical workers who are 'life-long' and 'life-wide' learners" (Mason, 2008).

15. **Experiential** – Learning per se, requires abilities that are basically diametrical, and that learners must repeatedly choose which set of learning abilities they will use in a particular learning situation. Some scholars are of the opinion that the acquisition of experience suggests learners find new information through encountering the tangible, relying on their senses, and immersing themselves in concrete reality (Kolb *et al.*, 2001). Similarly, experiential characteristics mean that as a starting point in the learning process, students can employ their own experiences and gradually are able to utilize their own practical experiences throughout the course. Whatever the students learn based on their direct experiences is experiential (Ruokamo *et al.*, 2012).

16. **Multi-representational** – For learning to be effective, there is the need to integrate multi-representational techniques. Computer-based learning environments for example, widely use multiple representations to convey and visualize complex materials. Therefore, in taking full advantage of dynamic multi-representational materials, learners are required to actively organize and consolidate associated elements from different and ephemeral information sources (Yeh *et al.*, 2010). Corroborated further is the contention that when faced with fresh and complex ideas, it would be best to have multiple external representations since they are capable of enabling an individual to have different opinions of ideas (Schwonke *et al.*, 2009). As expected, cogent arguments have been made concerning the presentation of information in both visual (pictures or animations) and verbal (text or narration) forms. The presentation in these forms, it is believed, considerably improves recall and problem-solving transfer by aiding learners encode the information in both visual and verbal forms which then, are integrated in long-term memory (Mayer, 2003). More significantly, instructional software can equally provide students with tools to make connections across multiple representations (Kozma, 2003). In the study, students recalled listening to podcasts, lectures, and other study-related audio materials via mobile technology.

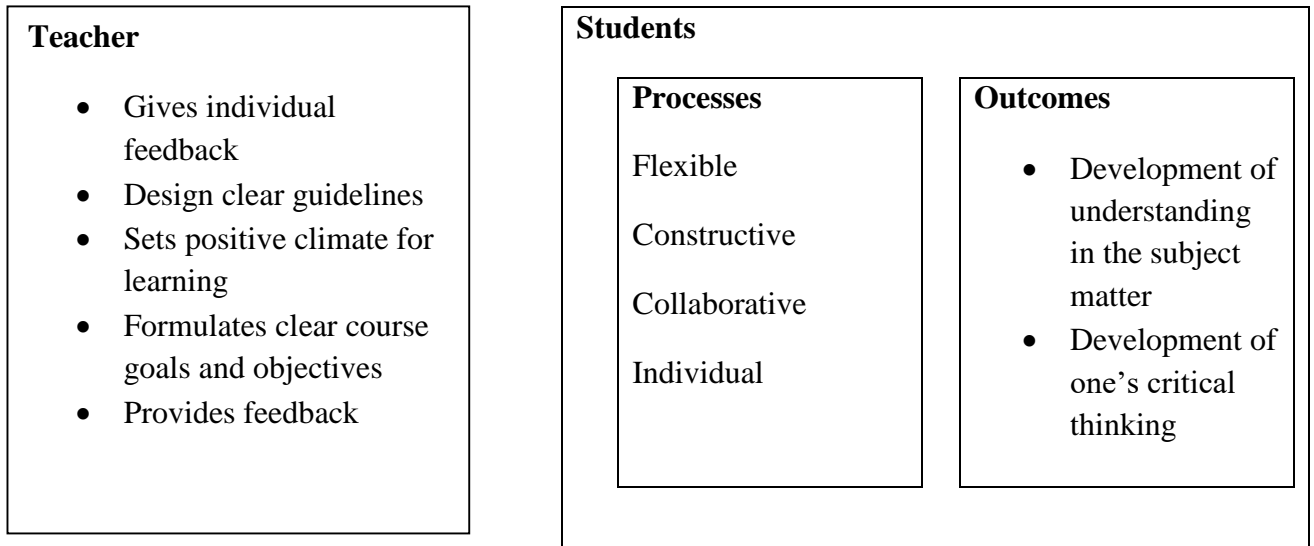
17. **Creative** – To be creative means solving a problem in a new way. Considering the circumstances and goals of the current age, it is no longer sufficient to simply transmit information that students memorize and store for future use. Education therefore must be focused on “helping students learn how to learn, so they can manage the demands of changing information, technologies, jobs, and social conditions” (Barron & Darling-Hammond, 2008). Indeed, for students to be creative, they have to be able to apply different

areas of knowledge to new problems and challenges. Several studies have also demonstrated that students learn more deeply and perform better on complex tasks if they have the opportunity to be involved in more “authentic” learning-projects and activities that require them to apply subject knowledge to solve practical problems (Barron & Darling-Hammond, 2010). In the same vein, a number of research have proven a positive impact on learning when students participate in lessons that require them to construct and organize knowledge, consider options, undertake detailed research, inquiry; writing and analysis, as well as to communicate effectively to audiences (Newmann, 1996). To develop these higher-order skills, students need to take part in complex, meaningful projects that require sustained engagement, collaboration, research, management of resources, and the development of an ambitious performance (Barron & Darling-Hammond, 2008). This study equally indicated how mobile technologies have provided opportunities for students to use their creativity in their studies.

### **2.2.3 The Enhanced Teaching and Meaningful e-Learning Model (ETMeL Model)**

As indicated in Figure 2.2, the Enhanced Teaching and Meaningful e-Learning (ETMeL) model is an upgrade of an existing pedagogical model (TML).

#### **Enhanced Teaching and Meaningful e-Learning (ETMeL)**



**FIGURE 2.2: The ETMeL Model Source: Ruokamo *et al.* 2012.**

The idea of reducing and simplifying the 17 process characteristics of meaningful learning in the TML model paved the way for the ETMeL model. This creation was made possible after a design-based research (DBR) had been conducted. Fundamentally, a design-based research (DBR) is about understanding how people learn, especially within the formal settings. It is also about designing ways to better ensure that learning will take place in these environments. According to Ruokamo *et al.* (2012), DBR targets the simultaneous improvement of both theory and local practices. In this research, the DBR in the ETMeL model is related to the theory of cognitive learning by Ausubel (1963, 1968; Ausubel *et al.* 1978). Thus for all intents and purposes, the ETMeL model is a viable model.

In general, the ETMeL model makes clear how the characteristics of meaningful learning can be grouped together in the “pedagogical and learning theoretical approaches to educational use of ICTs” (Ruokamo *et al.*, 2012). Not only that, it also brings to view how teaching and meaningful learning are achieved from the student perspective of the

“pedagogical and learning theoretical approaches to educational use of ICTs”. Further to that, a major plan for the preparation of the ETMeL model considers “designing, implementing, and evaluating meaningful e-learning in higher education” (Ruokamo *et al.*, 2012).

As recommended, creating an effective pedagogical model will not only increase the awareness in teachers about the various means by which technology can be used to deliver sound methods of practice and teaching, but also will provide technology skills training for students and faculty as a whole. Besides, a thorough understanding of how to use new technologies competently and efficiently in the teaching and learning process will ensure that students gain a lot from a more meaningful learning experience (Ruokamo *et al.*, 2012). A reminder though is that no unique way exists for the integration of technology into the teaching and learning processes.

Last but not least, to a significant extent, integration endeavors should be creatively designed for certain subject matter ideas in specific study hall or classroom contexts. Also, being aware that teaching with technology is elaborate, the recommendation is that understanding techniques to effective technology integration requires educators to develop new ways of understanding and cooperating with this complexity (Koehler & Mishra, 2009). As a matter of fact, this is one of the endeavors of the ETMeL model (see Figure 2.2).

To present a justification for the use of the theory and models, some past studies have been involved with them, including studies on educational digital video production (Hakkarainen *et al.*, 2009), mobile learning (Franklin, 2011), pedagogical models in

network-based education (Ruokamo *et al.*, 2002), and mobile technology (Turkle, 2011), to mention a few. In all these previous studies were various aspects touched on, indicating both models and the theory can be successfully applied to explain how students perceive the use of mobile technology in higher education learning. In addition, they are capable of being put to use to explain the pedagogic strategies of employing new learning opportunities with technology at the higher education level, how mobile technology can be effectively applied to improve students' learning in universities, as well as identifying some factors that impede higher education learning with mobile technology.

To restate, this thesis is about students' perceptions of using mobile technology in higher education learning. The study attempts to find how international degree and exchange students in a certain university in Finland consider the use of mobile technology in the teaching-studying-learning processes. In the theory of cognitive learning, the motivation is that the fact or condition of learners knowing something with familiarity gained through experience or association, is key to meaningful learning. The TML and the ETMeL models equally highlight both the students' learning processes and learning outcomes or to the expected outcomes. On account of these, the expectation is that learning with mobile technology is seen as 'existing within a context of information'. With the experience of owning a mobile device collectively and individually, learners utilize and create information thereby improving their learning. Moreover, students' interactions are mediated through technology and it is by means of such convolutions of interactions that information becomes meaningful and useful (Koole, 2009). Indeed, if mobile learning is learning through mobile computational devices (Quinn, 2000), and students are familiar with the use of their mobile devices (serving as their prior knowledge), then there is the

opportunity to break away from teaching that takes place in the lecture rooms, and to move to another location while communicating via information networks (Seppälä & Alamäki, 2003), and which can certainly pave the way for some new possibilities of students' learning. However, risk of distraction (Crescente & Lee, 2011) and other challenges to the efficient use of mobile technology in higher education learning cannot be overlooked.

I consider the theoretical models featured in the study relevant in analyzing the objectives of this research: exploring the perceptions of students concerning the use of mobile technology in higher education learning, investigating the rate of educational use of mobile technology; how and the extent by which students' familiarity with mobile devices have promoted their learning, and identifying the amount of hindrance in the educational use of mobile technology by university students. The TML model, for instance, had been applied by Hakkarainen *et al.* (2007) on achieving meaningful learning through digital video-supported case studies at the higher education level. The research had been necessitated by challenges faced by advanced educational institutions caused by changing in working life and new developments in the technology of digital video (DV) (Jonassen *et al.*, 2003; Kearney & Shuck, 2004, 2005). The study particularly focused on finding out the students' perspectives on whether: designing and producing digital video-supported cases and solving digital video-supported cases in an online course, supported meaningful learning as well as ascertaining the roles that digital videos played in the online students' meaningful learning process. In the end, the research indicated that designing and producing, together with solving the digital video-supported cases promoted, especially the 'active' and 'contextual' aspects of the students' meaningful learning as well as their positive 'emotional involvement' in the learning process. In actual fact, the aspects

promoted by the authors' research belong to the set of 17 process characteristics and expected outcomes through which meaningful learning is defined according to the TML model. In addition to that the focus of the study, with its accompanying research questions and the models were not only akin to this present study, but were also capable of being analyzed effectively. Similarly, based on a DBR process for designing, implementing, and refining a problem-based learning (PBL) course on educational digital video (DV) use and production in a certain university in Finland, Hakkarainen *et al.* (2009) examined students' learning processes and outcomes from the perspective of meaningful learning. In the initial stage of the study, the purpose was to analyze, from the view point of meaningful learning, pilot students' experiences of the DV production process and to apply the experiences in the DV course design. In the second stage of the study, the DV course was administered for the first time with the objective of investigating, from the point of view of meaningful learning, the students' learning processes and learning outcomes, as well as utilizing the research results to improve the course. Finally, the results proved that PBL offered a good model to enhance students' knowledge and skills in producing and using educational DV. The results also advanced that DV production was capable of being used as a method to learn about the subject matter of the DVs. As a matter of fact, apart from the researcher's use of the TML model, Hakkarainen *et al.* (2009) study also included a DBR process. As pointed out earlier, DBR involves developing, testing, investigating, and refining learning environment designs and theoretical constructs such as the pedagogical models that support learning, illustrate learning, and predict how learning occurs (Barab & Squire, 2004).



The study thus involved the processes of a DBR in DV use and production for instructional purposes which ultimately led to DV as a potential educational model. It is therefore the hope of the researcher of this current study that the DBR processes involved in the models propounded, will enhance, demonstrate, and even predict the use of mobile technology in the teaching-studying-learning processes at the higher education level, and the outcomes from the models thereof, provide explanatory frameworks that will specify expectations which may become the “the focus of investigation during the next cycle of inquiry” (Cobb *et al.*, 2003). Last but not least, a study by Gikas and Grant (2013), paying particular attention to 3 universities across the United States, presented some findings on students’ perceptions of learning with mobile technology and the roles social media played. The study was centered on examining teaching and learning when mobile computing devices like cell phones and smartphones, were administered in learning at the advanced level. Based on the models and students’ prior knowledge of mobile devices, it was contended that in learning with the mobile computing devices, learners can personalize the way they react with course content since with mobile learning, content can be more text aware and also be situated in the surroundings where learning is more meaningful to the learner (Gikas & Grant, 2013; Traxler, 2007). Furthermore, from the research, students can also modify “the transfer and access of information” so that they will be able to “build on their skills and knowledge to meet their own educational goals” (Sharples *et al.*, 2007). In making comparison of this point to aspects of the TML and the ETMeL models, Gikas and Grant (2013) achieved the meaningful learning process characteristics of ‘individuality or personalized’ where students could have individual interactive styles and strategies towards the course content. Moreover, since learning is situated in an enabling environment

of the students, there is some form of ‘flexibility’ in the achievement of meaningful learning (Garrison & Kanuka, 2004). In addition to that a ‘goal-oriented’ process feature had been achieved based on students working actively to achieve their cognitive goals or building on their skills and knowledge.

With the second aspect of the study which dealt with the roles that social media played in students’ learning with mobile computing devices, it was argued that using social media tools in learning supported a greater amount of student-centered course since they empowered students to interact and collaborate with one another as well as with their teachers (Gikas & Grant, 2013; Greenhow, 2011). Indeed, ‘collaboration’, being one of the significant process features in the models; and social media, considered as any online technology or practice that enables us share (e.g., content, opinions, insights, experiences, media) and have a conversation about the ideas we care about, have made it possible that students can make full use of one another’s skills and that they can offer social support and modeling for other students (Hakkarainen *et al.*, 2009). Thus respectively, ‘individual’, ‘goal-oriented’, ‘collaboration’, and ‘flexibility’ are process characteristics in the TML and ETMeL models. To recap, the aforementioned study had explored teaching and learning with mobile computing devices using facets of the TML and ETMeL models. It had also evaluated the merits and flaws of the use of mobile computing devices for learning in higher education institutions. In a similar way, this present study seeks to investigate students’ perceptions of using mobile technology in a higher education institution by also considering the explorations of the rate of educational use of mobile technology by higher education students, how the rate of mobile technology use has impacted on students’ learning, as well as the amount of hindrance in the successful use of mobile technology by

higher education students. In virtue of the reviewed studies made, I consider the theory of cognitive learning and the TML and the ETMeL models proper in the circumstances of this study.

### **2.3 Empirical Studies**

For the past few years, many projects have been conducted to explore the effectiveness of mobile learning as a new learning form. These projects vary from small projects that test the use of mobile devices to support learning at schools and universities, to large projects that are trying to build an integrated mobile learning environment which takes into account the learners' context.

The following list introduces some of the interesting projects in the mobile learning field:

Alagu and Thanuskodi. (2018) carried out a research with the aim to analyze students' awareness and use of ICT in the rural district of Dindigul city in India. The study adopted the survey research design, and data were obtained using a questionnaire that was distributed to the randomly selected 150 students in the rural area. Data obtained from the respondents was analyzed for both descriptive and inferential statistics using SPSS (version 23). Independent t-test and ANOVA test of differences were performed across two variables which are gender and age. The result of the study shows that majority of the respondents had positive awareness of ICTs.

Naji *et al.* (2011) carried out a study on students' awareness and requirement of mobile learning services in the higher education environment. The study aimed to explore the students' awareness and requirement of mobile learning services among Malaysian students in the higher education environment. A sample of 261 randomly selected students

was used for the study. A researcher adopted 5-points Likert scale questionnaire was used to obtain data from the respondents. Data obtained was analyze using Percentage descriptive statistics method. Result of the study shows that students have adequate knowledge and good awareness to use such technologies in their education environment.

Yusuf *et al.* (2018) carried out a study that investigated lecturers awareness, readiness and self-efficacy of using podcast for teaching and learning in Niger state. The research was a descriptive type using a survey method. The sample of the study consists of 420 lecturers drawn from six tertiary institutions across Niger state, Nigeria, a researcher designed instrument tagged “Lecturers’ Awareness, Readiness and self-efficacy in Podcast (LARSPQ)” consisting of 31 items was used to obtain data. Mean and standard deviation was used to answer the research questions. Result of the study shows that lecturers were aware of the use of podcast in teaching and learning.

Mustafa and Mustafa, (2018) carried out a study on attitude towards e-assessment: influence of gender, computer usage and level of education. An e-assessment scale was used with a sample of 853 students to investigate the influence gender towards e-assessment. A mimic modeling approach was utilized following a confirmatory factor analysis. The result shows that the male exhibited significantly more positive attitude towards e-assessment than female.

Aladesusi *et al.* (2018), carried out a research on assessment of undergraduate attitude to and utilization of mobile technologies for learning in Lagos state. This was a descriptive survey carried out on 298 randomly sampled undergraduates, using a researchers design questionnaire. Data collected was analyzed using Cronbach Alpha. The result shows that

there was no significance difference between male and female undergraduate students' attitude towards the use of mobile technologies.

John and Irene (2017), carried out a research that investigated students' perception and readiness towards mobile learning in colleges of education; a Nigerian perspective. This study adopts a quantitative research design, using a sample of 320 students from colleges of education. Descriptive and regression analysis was used to analyze the data obtained from the respondents through a researcher designed questionnaire. The result of the study shows that students in colleges of education in Nigeria had positive perception towards mobile learning, and are therefore ready to embrace the use.

Nuhu *et al.* (2017), carried out a study on perception of ICT status among lecturers and students on teaching and learning of engineering in Federal University of Technology Minna, Niger state. The study adopts cross sectional survey research design, the sample of the study consists of 1060 lecturers and students randomly drawn across the eight departments in the School of Engineering and Engineering Technology (SEET), FUT Minna. A researcher designed questionnaire was used to obtain data from the respondents, and the data obtained were analyze using frequency count and percentage methods. Result of the study shows that over 75% of the respondents agreed that there are ICT tools available for teaching and learning purposes.

Hayati *et al.* (2009), exploring learners' perception of mobile learning. The survey research was carried out in Malaysia with a sample of 185 first year undergraduate students whose perceptions on mobile learning were sought via a questionnaire. The data obtained from the respondents was analyzed using descriptive analysis. The findings of the study shows

strong evidence that students in tertiary institutions have positive perception of mobile learning, and that they see mobile learning as an opportunity for a more flexible learning experience.

Al-Fahad, (2009), carried out a quantitative survey research on 186 female students of King Saud University, Riyadh, Saudi Arabia. The aim of the research is to better understand and measure students' attitudes and perceptions towards the effectiveness of mobile learning. Data was collected using questionnaire, the analysis of the quantitative survey findings was presented focusing on the ramification for mobile learning (m-learning) practices in the university learning and teaching environment in order to determine how this technology can be better used to improve the students' retention. Result of this survey clearly indicated that mobile learning is a good method for improving students' retention ability. Thus, mobile technologies are hereby perceived as an effective tools in improving communication and learning among students.

Al Emran and Shalaan, (2017), carried out a survey research to investigate the students' attitudes towards the use of mobile technologies in the e-Evaluation system of instruction. The research instrument used for data collection was a “Research Questionnaire”, data was collected from 354 students of Al Buraimi University College (BUC) and was statistically analyzed. The findings of the study indicates that 99% of the respondents owned a mobile phone or tablets, thus, the students' attitudes were positive towards the use of mobile technologies.

Agah and Bicer (2018), embark on a mixed research (quantitative and qualitative research) with the aim to determine postgraduate students' attitudes towards mobile learning and

opinions on mobile learning. The research was carried out in Konya Necmettin Erbakan University, Ahmet Kelesoglu Education Faculties with a total of 30 postgraduate students. A “demographic data form” was used to collect data regarding student's personal information, in the quantitative part of the study, “mobile learning attitude scale” developed by Demir and Akpina (2018) was used to collect data to determine the attitude of the students on mobile learning, while on the qualitative part of the study, a “six (6) open-ended research questions” prepared by the researchers was used to collect data. The data collected were analyzed using SPSS 21.0 program. Findings of the study showed that the students' attitude were positive towards mobile learning as it tends to lift the time constraint and gives room to fast and more permanent way of learning.

Mayisela (2013), “The Potential Use of Mobile Technology: enhancing accessibility and communication in a blended learning course”. The purpose of the study was to establish how mobile technology could be used to enhance accessibility and communication in a blended learning course. Data were collected from a purposive convenience sample of 36 students engaged in the blended learning course. The Case Study research utilized a mixed method approach (quantitative and qualitative). An unstructured interview was conducted with the course lecturer, and the data obtained informed the design of the students' semi-structured questionnaire. The findings of the study showed that students with access to mobile technology had an increased opportunity to access the courseware of the blended learning course. Furthermore, mobile technology enhanced student-to-student and student-to-lecturer communication by means of social networks. The study concludes that mobile technology has the potential to increase accessibility and communication in a blended learning course.

## **2.4 Summary of Literature Reviewed**

This chapter provides insight on the discussion of m-learning, taking a look at awareness, perception, and attitude of undergraduate education students, characteristics of m-learning, m-learning technologies, mobile devices, learning context, theoretical support and educational models for effective m-learning and m-learning content were reviewed.

The importance of ICT has experienced tremendous growth due to its application in all areas of human endeavors, educational sector included. The emergence of Information and Communication Technology is seen as one of the major breakthrough in the teaching and learning process. The ability of teachers to administer and disseminate knowledge has been enhanced through technologies, so also is the learners' ability to decode abstract concepts to enhance and facilitate easy learning process. These technologies have also provided new opportunities for learners to acquire new skills and knowledge. The need to use computers efficiently has become a crucial part of education in Nigeria and the world at large. Institutions of learning now realize that with the acquisition of adequate ICT skills teachers and learners can boost their efficiency and can go about their work efficiently by practicing electronic teaching and learning.



## **CHAPTER THREE**

### **3.0 RESEARCH METHODOLOGY**

#### **3.1 Research Design**

The research design that was adopted for this study was a descriptive survey design. Descriptive survey research is a research where groups of people or items are studied through collecting and analyzing data from their representatives. The descriptive survey design is selected because of its high degree of representativeness and the ease in which the researcher could obtain the participants' opinion (Dodgson, 2017). This methodology involves the use of questionnaire to obtain the needed data from respondents.

### 3.2 Population of the Study

The population of this study comprised of 2,713 students from faculty/school of education from institutions of higher learning in Niger state. The institutions include; Usman Danfodio University Sokoto's (UDUSOK) affiliated degree studies in Niger State College of Education (COE) Minna, Ibrahim Badamasi Babangida University, Lapai, and Federal University of Technology, Minna (precisely, students from Educational Technology Department). The reason for selecting these institutions is because they are the only institutions that offer education courses at degree level in Niger State.

### 3.3 Sample and Sampling Technique

The sample of the study consisted of 300 (year two and above) students from the faculty/school of education in the three selected higher institutions in Niger State. The sample is in accordance with Krejcie and Morgan (1970) sample size determination table. The higher institutions, the faculty, and the level of students were selected purposively (only institutions that offers education at undergraduate level were selected, education faculty was selected from the institutions, and year one students were not selected because the researcher deemed that they may just have freshly resumed the institutions as at the time of the research), but the students that constitute the sample of the study were selected randomly in order that every student have equal opportunity of being picked for the study.

**Table 3.1: Breakdown of Population and Institutions under Study**

S/N	Institution	Faculty/School	Target Population	Sample Size
1	UDUSOK in Affiliation with Niger State College of Education Minna	School of Education	1,403	100

2	Ibrahim Badamasi Babangida University Lapai	School of Education	873	100
3	Federal University of Technology Minna	School of Science and Technology Education	440	100
<b>Total</b>			3,746	300

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Sources- Academic planning units of all the institutions sampled (2021).

### 3.4 Research Instrument

The research instrument used in this study to collect the needed data from the respondents was a researcher-designed questionnaire on awareness, perception, and attitude of undergraduate pre-service teachers on the use of mobile learning technologies for learning purposes in Niger State (QAPAUPTMLP). The questionnaire is a close-ended questionnaire and it consist of 30 items made up of four sections; A, B, C and D. Section A was used to collect demographic data of the respondents, Section B consists of 10 items, and was used to collect data on the awareness of the respondents towards mobile technologies for learning purposes, Section C consist of 10 items that was used to collect data on the perception of the respondents towards mobile technology for learning purposes, and Sections D also consist of 10 items which was used to collect data from the respondents on their attitude towards mobile technologies for learning purposes. Section B, C, and D were presented using a 5-point Likert scale in which Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D), and Strongly Disagree (SD) was awarded 5, 4, 3,

2, and 1 point(s) respectively. Response within the scores of 3.0 and above was regarded as agreement while the response scores below 3.0 were regarded as disagreement.

### **3.5 Validation of Research Instrument**

Validity of an instrument is the capacity of the instrument to measure what it is intended to measure. To ensure the validity of the instrument, the researcher-designed questionnaire (QAPAUPMLP) was validated by three educational experts from the department of educational technology and Science Education, Federal University of Technology, Minna. They critically looked at the contents and constructs validity to determine the instruments' suitability as regarding the targeted population in terms of clarity, depth and language. Their inputs led to further modification of the instrument.

### **3.6 Reliability of Research Instrument**

Reliability of instrument is its ability to constantly measure what it is designed to measure. The reliability of this research instrument was determined after a pilot study on 30 pre-service teachers from Niger State College of Education, Minna, who are part of the population, but not part of the sample for the study since they share related characteristics. The questionnaires was distributed to the pre-service teachers and retrieved by the researcher upon completion. The scores obtained was computed using Cronbach's Alpha formula and reliability coefficient index of 0.85, 0.82, and 0.79 were obtained from the

variables, (awareness, Perception, and Attitude) respectively. Based on the coefficient obtained, the instrument was considered reliable.

### **3.7 Method of Data Collection**

In the first week, letter of introduction was collected by the researcher from the Department of Educational Technology, Federal University of Technology Minna, and was presented to the appropriate authority of each sampled school in order to have access to the students of the schools for the research. Once permission was granted, the researcher then briefed the research assistants on the objectives of the study and how to fill the questionnaire to ensure that valid data are collected. The researcher and the research assistant from each of the respective schools then proceed to administer the questionnaire to the respondents. The respondents were approached randomly at different locations within each campus, after finding-out their level and departments, the researcher or the research assistant then brief the respondents on the objectives and how to fill the questionnaire, and then distributed the questionnaire to them. In order to ensure compliance and return of all the copies of the instrument, the researcher and the research assistant waited to ensure retrieval of the completed questionnaire. This process lasted for Three weeks (one week for each of the sampled institutions). The completed copies of the questionnaire were then taken for further analysis by the researcher. The study lasted for four weeks.

### **3.8 Method of Data Analysis**

The data collected from the sampled respondents were analyzed using descriptive and inferential statistics. The research questions one to six were answered using descriptive statistics; Mean and Standard Deviation. In section B of QAPAUPTMLP, the response

scores below 3.0 were adjudged as “unaware”, while the response scores of 3.0 and above were adjudged as “aware”, but in sections C and D of QAPAUPTMTL, the response scores below 3.0 were adjudged as negative, while the response scores of 3.0 and above were adjudged as positive. The t-test statistic was used to test the three null hypotheses; the significant difference was ascertained at alpha level of 0.05. The Statistical Package for Social Sciences (SPSS Version 23) was used for the analysis.

## **CHAPTER FOUR**

### **4.0 RESULTS AND DISCUSSION**

#### **4.1 Data Obtained From the Research Questions**

**Research Question One:** What is the awareness of undergraduate pre-service teachers towards the use of mobile technologies for learning purposes?

To answer the research question, mean and standard deviation and the analysis is presented in Table 4.1.

**Table 4.1: Mean and standard deviation of undergraduate pre-service teachers on their awareness towards the use of mobile technologies for learning purposes**

S/N	Constructs	N	Mean	Std. Dev	Decision
1.	I am aware of the various mobile learning technologies available for educational purposes.	300	4.38	0.66	Aware
2.	I am aware of the fact that mobile learning technologies help facilitates communication between the students' within and outside of classroom.	300	4.37	0.69	Aware
3.	I am aware that students can write tests and examinations online using mobile learning technologies.	300	4.39	0.79	Aware
4.	I am aware that lectures can be delivered to students without meetings in the classroom through the use of mobile learning technologies.	300	4.20	0.92	Aware
5.	I am aware that students can organize themselves in groups for sharing of information and instructions using mobile technologies.	300	4.43	0.57	Aware

6.	I am aware that learning materials from various educational sites can be downloaded using mobile learning technologies,	300	4.26	0.67	Aware
7.	Am aware that it is possible to teach students from the comfort of their house with the use of mobile learning technologies.	300	4.17	0.87	Aware
8.	I am aware that mobile learning technologies have a major important role in modern day education process.	300	4.37	0.72	Aware
9.	Am aware that mobile learning technologies do not instigates laziness among students.	300	3.55	1.08	Aware
10.	I am aware of the fact that assignments can be done and submitted to the lecturer using mobile learning technologies.	300	3.97	0.96	Aware
			<b>4.21</b>		
<b>Grand Mean</b>					

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Decision Mean = 3.0

Table 4.1 shows the calculated mean and standard deviation of undergraduate pre-service teachers' response on their awareness towards the use of mobile learning technologies for learning purposes. Table 4.1 shows the respective mean and standard deviation scores recorded for the constructs 1-10 to be as follows: Construct one, 4.38 and 0.66; construct two, 4.37 and 0.69; construct three, 4.39 and 0.79; construct four, 4.20 and 0.92; construct five, 4.43 and 0.57; construct six, 4.26 and 0.67; construct seven, 4.17 and 0.87; construct eight, 4.37 and 0.72; construct nine, 3.55 and 1.08; and construct ten, 3.97 and 0.96. Table 4.1 shows that the mean scores for the constructs 1-10 is between 3.55 and 4.43, and the



grand mean score is 4.21. The grand mean 4.21, been above the decision mean 3.0 is a clear indication that undergraduate pre-service teachers have awareness towards the use of mobile technologies for learning purposes. The standard deviation for the constructs 1-10 from table 4.1 is between 0.57 and 1.08, and the grand standard deviation for the constructs is 0.79.

**Research Question Two:** What is the perception of undergraduate pre-service teachers on the use of mobile technologies for learning purposes?

To answer the research question, mean and standard deviation and the analysis is presented in Table 4.2.

**Table 4.2: Mean and standard deviation of undergraduate pre-service teachers perception on the use of mobile technologies for learning purposes**

S/N	Constructs	N	Mean	Std. Dev	Decision
1	Mobile learning technologies are easier to use and they enhances better understanding.	300	4.11	0.75	Positive
2	The use of mobile technologies for educational purposes is innovative.	300	4.26	0.72	Positive
3	Mobile learning technologies at all times provide learning opportunities.	300	4.12	0.67	Positive
4	Mobile learning technologies allow students' to practice and gain real experience on abstract concepts.	300	4.16	0.85	Positive
5	The use of mobile learning technologies in education process makes learning faster.	300	4.35	0.65	Positive

6	Mobile learning technologies tend to motivate students' interest in learning than the traditional learning practice.	300	4.16	0.68	Positive
7	Mobile learning technologies increases students' productivity and self reliance.	300	3.99	0.73	Positive
8	Mobile learning technologies provide access to new and updated educational information, thus making them a reliable tool.	300	4.30	0.78	Positive
9	Mobile learning technologies at all time provides learners with unlimited access to online learning materials.	300	4.13	0.82	Positive
10	The use of mobile learning technologies for learning, keep students focused than the conventional classroom method.	300	4.17	0.75	Positive
<b>Grand Mean</b>			<b>4.18</b>		

Decision Mean = 3.0

Table 4.2 shows the calculated mean and standard deviation of undergraduate pre-service teachers' response on their perception towards the use of mobile learning technologies for learning purposes. Table 4.2 shows the respective mean and standard deviation scores recorded for constructs 1-10 to be as follows: Construct one, 4.11 and 0.75; construct two, 4.26 and 0.72; construct three, 4.12 and 0.67; construct four, 4.16 and 0.85; construct five, 4.35 and 0.65; construct six, 4.16 and 0.68; construct seven, 3.99 and 0.73; construct eight, 4.30 and 0.78; construct nine, 4.13 and 0.82; and construct ten, 4.17 and 0.75. Table 4.2 shows that the mean scores for the constructs 1-10 is between 3.99 and 4.30, and the grand mean score for the constructs is 4.18. The grand mean 4.18, been above the decision mean 3.0 is a clear indication that undergraduate pre-service teachers have positive perception

on the use of mobile technologies for learning purposes. The standard deviation for the constructs 1-10 from table 4.2 is between 0.65 and 0.85, and the grand standard deviation for the constructs is 0.74.

**Research Question Three:** What is the attitude of undergraduate pre-service teachers towards the use of mobile technologies for learning purposes?

To answer the research question, mean and standard deviation and the analysis is presented in Table 4.3.

**Table 4.3: Mean and standard deviation of undergraduate pre-service teachers on their attitude towards the use of mobile technologies for learning purposes**

S/N	Constructs	N	Mean	Std. Dev	Decision
1.	Mobile learning technologies will positively influence learners' learning ability.	300	4.31	0.70	Positive
2.	Mobile learning technologies will increase the degree of freedom and reduces anxiety among students performing educational task.	300	4.23	0.77	Positive
3.	I enjoy using mobile learning technologies for educational purposes.	300	4.37	0.78	Positive
4.	Teaching and learning with mobile tools is a skill needed for both teachers and learners to progress in their profession.	300	4.34	0.71	Positive
5.	Everyone can easily operate and understand mobile learning technologies.	300	3.70	1.00	Positive

6.	Mobile learning technologies will improve students' engagement in educational activities by offering a more relaxed and comfortable setting for learning.	300	4.19	0.70	Positive
7.	Mobile learning technologies will provide learners with more and sufficient detailed information on an abstract concept.	300	4.21	0.74	Positive
8.	Mobile learning technologies enable students to assimilate faster and wide within a short period of time.	300	4.29	0.71	Positive
9.	Mobile learning technologies allows students to actively participate in educational activities, thereby making it hard for students to be distracted.	300	3.91	0.91	Positive
10.	Mobile learning technologies should be adopted at all level of education	300	3.99	0.93	Positive
<b>Grand Mean</b>			<b>4.15</b>		

Decision Mean = 3.0

Table 4.3 shows the calculated mean and standard deviation of undergraduate pre-service teachers' response on their attitude towards the use of mobile learning technologies for learning purposes. Table 4.3 shows the respective mean and standard deviation scores recorded for the constructs 1-10 to be as follows: Construct one, 4.31 and 0.70; construct two, 4.23 and 0.77; construct three, 4.37 and 0.78; construct four, 4.34 and 0.71; construct five, 3.70 and 1.00; construct six, 4.19 and 0.70; construct seven, 4.21 and 0.74; construct eight, 4.29 and 0.71; construct nine, 3.91 and 0.91; and construct ten, 3.99 and 0.93. Table 4.3 shows that the mean scores for the constructs 1-10 is between 3.70 and 4.37, and the grand mean score for the constructs is 4.15. The grand mean 4.15, been above the decision

mean 3.0 is a clear indication that undergraduate pre-service teachers have positive attitude towards the use of mobile technologies for learning purposes. The standard deviation for the constructs 1-10 from table 4.3 is between 0.70 and 1.00, and the grand standard deviation for the constructs is 0.80.

**Research Question Four:** what is the difference between male and female undergraduate pre-service teachers’ awareness towards the use of mobile technologies for learning purposes?

To answer the research question, mean and standard deviation and the analysis is presented in Table 4.4.

**Table 4.4: Mean and standard deviation response of male and female undergraduate pre-service teachers’ awareness towards the use of mobile technologies for learning purposes**

<b>Group</b>	<b>N</b>	<b>Mean</b>	<b>Std. Dev</b>
Male	150	41.98	4.11
Female	150	42.20	4.49

Table 4.4 shows the calculated mean and standard deviation for both male and female undergraduate pre-service teachers’ on their awareness towards the use of mobile technologies for learning purposes. The calculated mean and standard deviation score for 150 male and 150 female respectively is: (male, 41.98 and 4.11), and (female, 42.20 and 4.49) respectively. Table 4.4 indicates there is a difference in the mean and standard deviation response of male and female. To determine if the difference is significant, a corresponding hypothesis is tested and presented in table 4.7.

**Research Question Five:** what is the difference between male and female undergraduate pre-service teachers' perception towards the use of mobile technologies for learning purposes?

To answer the research question, mean and standard deviation and the analysis is presented in Table 4.5.

**Table 4.5: Mean and standard deviation response of male and female undergraduate pre-service teachers' perception on the use of mobile technologies for learning purposes**

Group	N	Mean	Std. Dev
Male	150	42.18	3.58
Female	150	41.32	5.16

Table 4.5 shows the calculated mean and standard deviation for both male and female undergraduate pre-service teachers' perception on the use of mobile technologies for learning purposes. The calculated mean and standard deviation score for 150 male and 150 female respectively is: (male, 42.18 and 3.58), and (female, 41.32 and 5.16) respectively. Table 4.5 indicates there is a difference in the mean and standard deviation response of male and female. To determine if the difference is significant, a corresponding hypothesis is tested and presented in table 4.8.

**Research Question Six:** what is the difference between male and female undergraduate pre-service teachers' attitude towards the use of mobile technologies for learning purposes?

To answer the research question, mean and standard deviation and the analysis is presented in Table 4.6.

**Table 4.6: Mean and standard deviation response of male and female undergraduate pre-service teachers' attitude towards the use of mobile technologies for learning purposes**

<b>Group</b>	<b>N</b>	<b>Mean</b>	<b>Std. Dev</b>
Male	150	42.14	3.52
Female	150	40.94	5.31

Table 4.6 shows the calculated mean and standard deviation for both male and female undergraduate pre-service teachers' on their perception towards the use of mobile technologies for learning purposes. The calculated mean and standard deviation score for 150 male and 150 female respectively is: (male, 42.14 and 3.52), and (female, 40.94 and 5.31) respectively. Table 4.6 indicates there is a difference in the mean and standard deviation response of male and female. To determine if the difference is significant, a corresponding hypothesis is tested and presented in table 4.9.

### **Testing of Null Hypotheses**

**Hypothesis One (H<sub>01</sub>):** there is no significant difference between male and female undergraduate pre-service teachers' awareness towards the use of mobile technologies for learning purposes.

To answer the research hypotheses, t-test result and analysis is presented in Table 4.7.

**Table 4.7: t-test result of male and female undergraduate pre-service teachers' awareness towards the use of mobile technologies for learning purposes.**

<b>Gender</b>	<b>N</b>	<b>Df</b>	<b>Mean</b>	<b>Std. Dev</b>	<b>t-value</b>	<b>p-value</b>
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Male	150		41.98	4.11		
		298			-0.443 <sup>ns</sup>	0.658
Female	150		42.20	4.49		

NS: Not Significant at 0.05 Level

Table 4.7 shows the t-test result of male and female undergraduate pre-service teachers' response on their awareness towards the use of mobile learning technologies for learning purposes. The calculated mean scores for male and female are 41.98 and 42.20 respectively, with a t-value of 0.443<sup>ns</sup>, and the p-value is 0.658. The calculated p-value 0.658 is greater than 0.05 alpha level of significance and therefore, null hypothesis one is accepted. This implies that there is no significant difference between the response of male and female undergraduate pre-service teachers' awareness towards the use of mobile technologies for learning purposes.

**Hypothesis Two (Ho<sub>2</sub>):** there is no significant difference between male and female undergraduate pre-service teachers' perception on the use of mobile technologies for learning purposes.

To answer the research hypotheses, t-test result and analysis is presented in Table 4.8.

**Table 4.8: t-test result of male and female undergraduate pre-service teachers' perception on the use mobile technologies for learning purposes**

Gender	N	Df	Mean	Std. Dev	t-value	p-value
Male	150		42.18	3.58		
		298			1.677 <sup>ns</sup>	0.095
Female	150		41.32	5.16		

NS: Not Significant at 0.05 Level

Table 4.8 shows the t-test result of male and female undergraduate pre-service teachers' response based on their perception on the use of mobile technologies for learning purposes.



The calculated mean scores for male and female are 42.18 and 41.32 respectively, with a t-value of 1.677<sup>ns</sup>, and the p-value calculated is 0.095. The calculated p-value 0.095 is greater than 0.05 alpha level of significance and therefore, null hypothesis two is accepted. This implies that there is no significant difference between the response of male and female undergraduate pre-service teachers' perception towards mobile technologies for learning purposes.

**Hypothesis Three (H<sub>03</sub>):** there is no significant difference between male and female undergraduate pre-service teachers' attitude towards the use of mobile technologies for learning purposes.

To answer the research hypotheses, t-test result and analysis is presented in Table 4.9.

**Table 4.9: t-test result of male and female undergraduate pre-service teachers' attitude towards the use of mobile learning technologies for learning purposes.**

Gender	N	Df	Mean	Std. Dev	t-value	p-value
Male	150		42.14	3.52		
		298			2.307 <sup>ns</sup>	0.022
Female	150		40.94	5.31		

NS: Not Significant at 0.05 Level

Table 4.9 shows the t-test result of male and female undergraduate pre-service teachers' response based on their attitude towards the use of mobile technologies for learning purposes. The calculated mean scores for male and female are 42.14 and 40.94 respectively, with a t-value of 2.307<sup>ns</sup>, and the p-value calculated is 0.022. The calculated p-value 0.022 is less than 0.05 alpha level of significance and therefore, null hypothesis three is rejected. This implies that there is significant difference between the response of

male and female undergraduate pre-service teachers' attitude towards mobile technologies for learning purposes.

## **4.2 Summary of Findings**

From the collected data, processed, analyzed and interpreted in this study, the findings are summarized as follow:

1. Undergraduate pre-service teachers' in Niger state have awareness towards mobile technologies for learning purposes.
2. Undergraduate pre-service teachers' in Niger state have positive perception on the use of mobile technologies for learning purposes.
3. Undergraduate pre-service teachers' in Niger state have a positive attitude towards mobile technologies for learning purposes.
4. There was no significant difference between male and female undergraduate pre-service teachers' awareness towards mobile technologies for learning purposes in Niger state.
5. There was no significant difference between male and female undergraduate pre-service teachers' perception on the use of mobile technologies for learning purposes in Niger state.
6. However, there was a significant difference on the attitude of male and female undergraduate pre-service teachers' in Niger state towards mobile technologies for learning purposes.

## **4.3 Discussion of Findings**

Findings of this study revealed that undergraduate pre-service teachers' in Niger state were aware of the use of mobile learning technologies for learning purposes. This finding is in agreement with the finding of Alagu and Thanuskodi (2018) who discovered that students' have awareness of ICTs for learning. Also, this finding is in accordance with the findings of Naji *et al.* (2011) whose result shows that students have good awareness to use technologies in their education environment.

Findings from this study shows that Niger state undergraduate pre-service teachers have positive perception on the use of mobile learning technologies for learning purposes. This is in accordance with the findings of John and Irene (2017), who discovered that students in colleges of education in Nigeria have positive perception of mobile learning technologies. Also, this finding is in agreement with that of Nuhu *et al.* (2017) whose finding shows that over 75% of their respondents agreed to have good perception of ICT tools available for teaching and learning purposes.

Findings of this study revealed that undergraduate pre-service teachers in Niger state have a positive attitude towards the use of mobile learning technologies for learning purpose. This result is in line with that of Al Emran and Shalaan (2017), whose findings revealed that students' attitude were positive towards the use of mobile technologies. Also, this finding is in accordance with the findings of Agah and Bicer, (2018) whose findings showed that students' attitude were positive towards mobile learning as it tends to lift the time constraint and give room to fast and more permanent way of learning.

Finding of this study shows that there was no significant difference between male and female undergraduate pre-service teachers' awareness on the use of mobile learning

technologies for learning purposes in Niger state. This finding is in agreement with the finding of Aladesusi *et al.* (2018) who discovered that there is no significance difference between male and female awareness of mobile technologies.

The finding of this study shows that there was no significant difference between male and female undergraduate pre-service teachers' perception on the use of mobile learning technologies for learning purposes in Niger state. This finding is in line with the finding of Hayati *et al.* (2009) who revealed that students in tertiary institutions have positive perception with no gender influence on mobile learning.

Finding of this study shows that there was a significant difference between the attitude of male and female undergraduate pre-service teachers' attitude towards the use of mobile learning technologies for learning purposes in Niger state. This is in accordance with the finding of Mustafa and Mustafa (2018), who discovered that male exhibited significantly more positive attitude towards e-assessment than female. This in turn is in disagreement with Aladesusi *et al.* (2018).

## **CHAPTER FIVE**

### **5.0 CONCLUSION AND RECOMMENDATIONS**

#### **5.1 Conclusion**

Based on finding of this study, it can be concluded that undergraduate pre-service teachers' in Niger state have awareness on the use of mobile technologies for learning purposes. The study also revealed that there was no significant difference between the male and female

undergraduate pre-service teachers' awareness. The study revealed that undergraduate pre-service teachers' have positive perception on the use of mobile learning technologies for learning purposes in the state. The study also revealed that there was no significant difference between male and female perception. Furthermore, this study revealed that the undergraduate pre-service teachers' in Niger state have positive attitude towards the use of mobile learning technologies for learning purposes. However, the study indicated that there was significant difference between male and female undergraduate pre-service teachers' attitude.

## **5.2 Recommendations**

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

- I. Undergraduate pre-service teachers' should be encouraged to adopt mobile learning technologies for learning purposes. This will enhance their learning ability and help them build self-confidence.
- II. Tertiary institutions should provide necessary facilities that will aid the undergraduate pre-service teachers' to have easy and unlimited access to online learning materials at all time.
- III. Governments and institutions should make provisions that will ensure adequate power supplies, and continuous sensitization for the undergraduate pre-service teachers' on the use of mobile learning technologies.
- IV. Non-Governmental organizations can help in creating awareness and more sensitization on mobile learning technologies through sponsored television programs and adverts.

- V. Parents and tertiary institutions should take a measure to ensure that every student is equipped with at least a mobile learning technology device while on campus.

### **5.3 Limitation of the Study**

The limitations of this study are as follows;

1. This study was limited to three tertiary institutions out of the six public institutions in Niger state with faculty of education.
2. Only undergraduate pre-service teachers from the three tertiary institutions that offers first degree were selected for this study, i.e., pre-service teachers' that are not in this category of students were not selected for this study.
3. Students studying other courses different from education, or not in faculty of education were not selected for this study.

### **5.4 Contributions to Knowledge**

This study has contributed to the pool of knowledge in the following ways;

1. Mobile learning technologies can be adopted to enhance the flow of information and learning materials between teachers' and students.
2. Mobile learning technologies could be effectively used to eliminate the constraint of face to face classroom method of learning between teachers' and students. i.e. lectures can take place in disperse location and at any time.

## 5.5 Suggestions for Further Studies

For further research purposes, the following suggestions should be considered:

1. A replicate of this study can be conducted among students studying other courses in tertiary institutions in Niger state.
2. Similarly, studies on awareness, perception, and attitude of undergraduate pre-service teachers' can also be conducted in other higher institutions across the country.
3. Effect of mobile learning technologies on pre-service teachers' retention and performance in educational process.

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## APPENDIX

### **A RESEARCHER-DESIGNED QUESTIONNAIRE ON THE TOPIC: AWARENESS, PERCEPTION AND ATTITUDE OF UNDERGRADUATE PRE- SERVICE TEACHERS ON THE USE OF MOBILE LEARNING TECHNOLOGIES FOR LEARNING PURPOSES IN NIGER STATE**

Dear Respondent,

This questionnaire is designed to elicit your responses on the above subject matter. Any information given will be used purposely for research and will be treated with utmost confidentiality.

Examples of Mobile Technologies: smartphones, MP3 players, notebooks, laptops, palmtops, PDA, etc.

**SECTION A** (Students Demographic information)

**Gender:**    male                    female

**Level:**        200     300     400     500

**INSTITUTION:**.....  
.....  
.....

**SECTION B: Awareness of Undergraduate Pre-service Teachers on The Use of Mobile Technology For Teaching And Learning.**

**Instruction:** choose the option that you deemed suitable to answer the statement from the table below;

**Questionnaire Acronyms’:**

**SA**    =    Strongly Agree

**A**     =    Agree

**U**     =    Undecided

**D**     =    Disagree

**SD**   =    Strongly Disagree

S/N	ITEMS	SA	A	U	D	SD
1.	I am aware of the various mobile learning technologies available for educational purposes.					
2.	I am aware of the fact that mobile learning technologies help facilitates communication between the students’ within and outside of classroom.					
3.	I am aware that students can write tests and examinations online using mobile learning technologies.					

4.	I am aware that lectures can be delivered to students without meetings in the classroom through the use of mobile learning technologies.					
5.	I am aware that students can organize themselves in groups for sharing of information and instructions using mobile technologies.					
6.	I am aware that learning materials from various educational sites can be downloaded using mobile learning technologies,					
7.	Am aware that it is possible to teach students from the comfort of their house with the use mobile learning technologies.					
8.	I am aware that mobile learning technologies have a major important role in modern day education process.					
9.	Am aware that mobile learning technologies do not instigates laziness among students.					
10.	I am aware of the fact that assignments can be done and submitted to the lecturer using mobile learning technologies.					

**SECTION C: Perception of Undergraduate Pre-service Teachers on The Use of Mobile Technology For Teaching And Learning**

11.	Mobile learning technologies are easier to use and they enhances better understanding.					
12.	The use of mobile technologies for educational purposes is innovative.					
13.	Mobile learning technologies at all times provide learning opportunities.					

14.	Mobile learning technologies allow students' to practice and gain real experience on abstract concepts.					
15.	The use of mobile learning technologies in education process makes learning faster.					
16.	Mobile learning technologies tend to motivate students' interest in learning than the traditional learning practice.					
17.	Mobile learning technologies increases students' productivity and self-reliance.					
18.	Mobile learning technologies provide access to new and updated educational information, thus making them a reliable tool.					
19.	Mobile learning technologies at all times provides learners with unlimited access to online learning materials.					
20.	The use of mobile learning technologies for learning, keep students focused than the conventional classroom method.					

**SECTION D: Attitudes of Undergraduate Pre-service Teachers on The Use of Mobile Technology For Teaching And Learning**

21.	Mobile learning technologies will positively influence learners' learning ability.					
22.	Mobile learning technologies will increase the degree of freedom and reduces anxiety among students performing educational task.					
23.	I enjoy using mobile learning technologies for educational purposes.					



24.	Teaching and learning with mobile tools is a skill needed for both teachers and learners to progress in their profession.					
25.	Everyone can easily operate and understand mobile learning technologies.					
26.	Mobile learning technologies will improve students' engagement in educational activities by offering a more relaxed and comfortable setting for learning.					
27.	Mobile learning technologies will provide learners with more and sufficient detailed information on an abstract concept.					
28.	Mobile learning technologies enable students to assimilate faster and wide within a short period of time.					
29.	Mobile learning technologies allows students to actively participate in educational activities, thereby making it hard for students to be distracted.					
30	Mobile learning technologies should be adopted at all level of education					

## APPENDIX B

### SPSS ANALYSIS OF RESULTS

#### 1. Descriptive Statistics Analysis of Mean and Standard Deviation of Undergraduate Pre-service Teachers' Awareness on the use of Mobile Learning Technologies for Learning Purposes.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
aware1	300	1.00	5.00	4.3800	.66110
aware2	300	2.00	5.00	4.3700	.68897
aware3	300	1.00	5.00	4.3900	.78738
aware4	300	1.00	5.00	4.2000	.91805
aware5	300	3.00	5.00	4.4300	.57113
aware6	300	1.00	5.00	4.2600	.67373
aware7	300	1.00	5.00	4.1700	.87387
aware8	300	1.00	5.00	4.3700	.71751
aware9	300	1.00	5.00	3.5500	1.08231
aware10	300	1.00	5.00	3.9700	.95506
Valid N (listwise)	300				

**2. Descriptive Statistics Analysis of Mean and Standard Deviation of Undergraduate Pre-service Teachers' Perception on the use of Mobile Learning Technologies for Learning Purposes.**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
perc1	300	1.00	5.00	4.1100	.74818
perc2	300	1.00	5.00	4.2600	.71702
perc3	300	1.00	5.00	4.1200	.66865
perc4	300	1.00	5.00	4.1600	.84663
perc5	300	2.00	5.00	4.3500	.65493
perc6	300	1.00	5.00	4.1600	.67522
perc7	300	1.00	5.00	3.9900	.72916
perc8	300	1.00	5.00	4.3000	.78233
perc9	300	1.00	5.00	4.1300	.82180
perc10	300	1.00	5.00	4.1700	.75032
Valid N (listwise)	300				

**3. Descriptive Statistics Analysis of Mean and Standard Deviation of Undergraduate Pre-service Teachers' Attitude on the use of Mobile Learning Technologies for Learning Purposes.**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
att1	300	1.00	5.00	4.3100	.70395
att2	300	1.00	5.00	4.2300	.79952
att3	300	1.00	5.00	4.3700	.78432
att4	300	1.00	5.00	4.3400	.71140
att5	300	1.00	5.00	3.7000	.99665
att6	300	1.00	5.00	4.1900	.70395
att7	300	2.00	5.00	4.2100	.74008
att8	300	2.00	5.00	4.2900	.71245
att9	300	1.00	5.00	3.9100	.90810
att10	300	1.00	5.00	3.9900	.93424
Valid N (listwise)	300				

**4. Analysis of Mean and Standard Deviation Response of Male and Female Undergraduate Pre-service Teacher' Awareness on the Use of Mobile Learning Technologies for Learning Purposes.**

**Group Statistics**

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Awareness	male	150	41.9800	4.11491	.33598
	female	150	42.2000	4.48712	.36637

**5. Analysis of Mean and Standard Deviation Response of Male and Female Undergraduate Pre-service Teacher' Perception on the Use of Mobile Learning Technologies for Learning Purposes.**

**Group Statistics**

	Gender	N	Mean	Std. Deviation	Std. Error Mean
perception	male	150	42.1800	3.58234	.29250
	female	150	41.3200	5.16093	.42139

**6. Analysis of Mean and Standard Deviation Response of Male and Female Undergraduate Pre-service Teacher' Attitude on the Use of Mobile Learning Technologies for Learning Purposes.**

**Group Statistics**

	Gender	N	Mean	Std. Deviation	Std. Error Mean
attitude	Male	150	42.1400	3.52180	.28755
	female	150	40.9400	5.30699	.43331

**7. T-test Analysis of Male and Female Undergraduate Pre-service Teacher' Awareness on the Use of Mobile Learning Technologies for Learning Purposes.**

**Independent Samples Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Awareness	Equal variances assumed	.778	.378	-.443	298	.658	-.22000	.49710	-1.19828	.75828
	Equal variances not assumed			-.443	295.793	.658	-.22000	.49710	-1.19831	.75831

**8. T-test Analysis of Male and Female Undergraduate Pre-service Teacher' Perception on the Use of Mobile Learning Technologies for Learning Purposes.**

**Independent Samples Test**

	Levene's Test for Equality of Variances	t-test for Equality of Means								
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Perception	Equal variances assumed	5.431	.020	1.677	298	.095	.86000	.51295	-.14947	1.86947
	Equal variances not assumed			1.677	265.529	.095	.86000	.51295	-.14998	1.86998

**9. T-test Analysis of Male and Female Undergraduate Pre-service Teacher' Attitude on the Use of Mobile Learning Technologies for Learning Purposes.**

**Independent Samples Test**

	Levene's Test for Equality of Variances	t-test for Equality of Means								
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Attitude	Equal variances assumed	15.690	.000	2.307	298	.022	1.20000	.52005	.17657	2.22343
	Equal variances not assumed			2.307	258.918	.022	1.20000	.52005	.17594	2.22406