PERCEPTION AND ACCEPTANCE OF DIGITAL TECHNOLOGY FOR INSTRUCTION AMONG UNIVERSITY PRE-SERVICE BIOLOGY TEACHERS IN NIGER STATE

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ABSTRACT

The study investigates the perception and acceptance of digital technology for instruction among university pre-service biology teachers in Niger State. The sample size of one hundred and fifty respondents was used. A stratified random technique was used to select the sample size of the study. The researcher used Taro Yamane's formula to determine the sample size from the population. The method of data collection was by administering questionnaire which was grouped into respondents perceived usefulness (PU), perceived ease of use (PEOU) and the extent of acceptance of digital technology. A software called SPSS version 22.0 was used to analyze the data collected from the responses. The results were presented in the form of descriptive statistics. A bench mark of 2.5 was used to determine positive responses. The study found out that Respondents has positive notion that the use of Digital Technology can make learning process more effective as this has a mean of 3.62 and standard deviation of 0.98. A greater percentage also supported that the use of Digital Technology can increase students' motivation, foster positive attitudes of students towards learning, and can make learning activities more interesting and enjoyable. In term of Ease of use, respondents agreed that the use of digital Technology also provides convenience in communication. So in general, a total mean and standard deviation of $\bar{x}$=3.73; SD=1.0) agreed that Teaching using digital technology is not difficult, and all respondents seems to like it. The study also reveals high extent of acceptance of digital technology as all responses returned positive.t-square analysis was used to verify the difference in the perceived usefulness of digital technologies for instruction amongst males and females University Pre-service Biology teachers. The mean of male and female was 21.54 and 20.98 respectively which is not significant, with the calculated t value of 0.675 ($t = 0.675$, $df = 148$, $p > .05$). Therefore there is no significant difference in the mean responses of male and female perceived usefulness of digital technology. Therefore the null hypothesis is supported and must be accepted for the items. The findings revealed that there is no significant difference in the mean responses of male and female perceived ease of use of digital technology as the calculated t value is 0.795 ($t = 0.795$, $df = 148$). Since the p-value is 0.41, the null hypothesis is accepted. This implies that there is no significant difference in the mean responses of male and female perceived ease of use of digital technology.

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CHAPTER ONE

1.0 INTRODUCTION

1.1. Background to the Study

Digital technology and information advances nowadays have implications for learning patterns in schools. The emergence of digital based learning innovations, such as e-learning, virtual classes, game-based learning, interactive multimedia, computer-based learning, and so on fosters student’ s independent learning. Learning is not only limited by classroom partitions and time, but can browse information online through computers and smartphones, so that the 21st century demands innovation in the learning process (Wahyudi, 2019). There are new challenges facing teachers today. One of these challenges is the steady increase of technology (e.g., computers, Internet) in schools over the past decade. The increasing amount of technologies present creates an additional burden for today’ s teac333hers because there are concerns about how they will be used:The rapid growth of Digital Technology in the last three decades has significantly transformed the educational landscape globally (Karlin, 2018) Today, the concept of “literacy ” has been redefined by some researchers to accommodate “digital literacies” (Al-Azawei et al, 2017). These researchers further strongly advocate that in the current digital-age, learners have to be able to solve complex problems, think creatively and critically; and communicate and collaborate with others from diverse backgrounds. In this context, the use of Digital Technologies for the purposes of improving and enriching teaching and instruction has received a great deal of attention world-wide.

In this regard, governments and education systems all over the world have placed high priority on the integration of Digital Technology in education, in order to remain competitive in a global

world (Brush, 2009; Mswazi, 2014; Perisco et al, 2014). This phenomenon has placed great demands on education systems and schools, especially in the developing and emerging countries, to acculturate their students to be lifelong learners; to learn how to seek out new information, think critically, and to show initiative to meet the challenges of the fast-changing world (Lim & Chan, 2010). To this end, mastering Digital Technology skills and utilizing digital technology towards creating an improved teaching and instruction is of utmost importance to teachers in creating a new learning culture in the 21st Century (Davis, 2018; UNESCO, 2016).

In light of the great progress in technology in recent years in this new digital age, most developed and developing countries are reviewing their education systems in general, and their teacher preparation programs in particular. To best meet the needs of today’s students, pre-service teachers should be trained though high-quality preparation programs that prepare them with important knowledge, skills, experiences, and guidance. Since teacher preparation programs address education and training in the same setting (Kirschner&Selinger, 2012), academic courses included in such programs are ideal for simultaneously instructing future teachers on how to integrate technology effectively into their eventual classrooms. Furthermore, digital technology platforms have become an essential part of our everyday lives because, as noted by (Poore, 2011), “as we move more and more into cyberspace we have to contemplate how we want to live and how we want to be human”. Therefore, pre-service and in-service teachers must improve their digital skills through professional development and training programs to be better able to devise the strategies that can help them create modern curricula that include the innovative use of technology. Educators must ensure that they are aware of the full range of digital tools available and are fully literate in their use to best serve today’s students (Poore,

2011). Many educational researchers have found that technology is under-used and attribute this to the following factors: the personal pedagogical beliefs of individual educators; the professional development the teacher has undergone; institutional policy at the school; and the accessibility of technology in the teaching environment, which is often related to the economic status of the particular institution (Eristi&Dindar, 2012). Although it is understandable that these factors might cause teachers to have issues with the incorporation of technology into the classroom, when introduced appropriately, technology in education can greatly enhance student learning and academic success (Ozel et al, 2008).. Indeed, how we use technology in education has been changing rapidly (Gilakjani& Ismail, 2013), which requires that teacher preparation programs are constantly updated to keep up with changing instructional practices (Davis, 2017). Today, with so many electronic devices readily available to us, including digital cameras with which we can create images and videos as well as easily upload them to social sites for sharing, we live in a true visual environment.

Consequently, this thesis employed some factors which are the perceived usefulness, perceived ease of use and the acceptance of digital Technology. The term perceived usefulness has to do with the degree to which a [person believes that using a particular system would enhance his or her performance. Relating this to this thesis, TAM, described perceived usefulness as the degree to which a person believes that using a particular system would enhance his or her job performance. In 1992, Davis et al., reported that perceived usefulness refers to consumers' perceptions regarding the outcome of the experience. Davis (1993) defined perceived usefulness as the individual' s perception that using the new technology will enhance or improve her/his performance. This addresses a technology's impact on Job performance. Perceived ease of use

(PEU) refers to the level to which an activity offered by a learning management system (LMS) is perceived to be pleasant, independently of expected performance

outcomes. it can also be seen as the level to which a user is convinced that Digital Technology use is effort-free. When a technology is viewed as being easy to use, it is likely that individuals will develop a positive attitude towards it. In this study, PEU refers to the level to which Pre-

Service Biology teachers are convinced that Digital Technology use is both easy and beneficial. While PU addresses a technology's impact on Job performance, perceived ease is a technology's influence on performance processes.

Digital technology acceptance has to do with the degree to which the pre-service Biology teachers are willing to accept or inculcate the use of Digital Technology in teaching and learning process. This will in turn lead to a more effective and efficient outcome of learners. So this thesis sort to examine the perception and acceptance of digital technology for instruction among University Pre-service Biology teachers in Niger State.

1.2. Statement of the Problem

A systematic approach to the processes and resources of teaching, digital technology utilizes technology to improve the performance of students. It identifies the needs of individuals, adapting technology to classroom instruction and in the tracking of student development. It requires teachers to accurately reveal the needs of students in order to determine the relevant technology to apply to the curriculum and to track the results to determine the effectiveness of the measures. Educational technology is a fairly new field in the education sector, and not all teachers are ready to start implementing such technologically-driven plans.

Digital Learning with the aid of digital technology makes students smarter. Learning tools and digital technology enable students to develop effective self-directed learning skills. They are able to identify what they need to learn, find and use online resources, apply the information on the problem at hand, and even evaluate resultant feedback. Technology has the ability to enhance relationships between teachers and students, technology also help make teaching and learning more meaningful and fun. Students are also able to collaborate with their own classmates through technological applications. With the incorporation of technology into schools, the main purpose is to change how teachers and students gather, access, analyse, present and transmit information. This can democratize information in classrooms as well as help differentiate instruction, particularly for students with special needs.

To really utilize these tools, teachers should ask themselves why students want technology in the classroom, not just why they need it. It can definitely help education professionals in the monitoring of individual development and innovative lesson planning. But the students who learn through technology can create a set of skills that will help them throughout their own future careers. Many believe that technology can enhance individual learning, removing educational boundaries that teachers may face. It enables online education, distance learning, and access to up-to-date information. Because each student interprets this information differently, technology can enable more research into subjects that are more difficult to learn.

The challenges of integrating technology into the classroom may be more pronounced for young teachers entering the profession, because more experienced colleagues and administrators might have unrealistic expectations regarding young teachers' comfort and expertise in using technology (Gilakjani, Leong, & Ismail, 2013). Most pre-service teachers today are comfortable

using technology in their personal lives, for communication, social networking, or entertainment. They have not, however, had the experience of planning for and using educational technologies for instruction, or perhaps have never imagined how they might use technologies in the classroom (Kvavik& Caruso., 2013). In fact, research indicates pre-service teachers are no better at integrating technology into their teaching than their more experienced colleagues (Ertmer et al., 2012; Pegler, Kollewyn, & Crichton, 2010). Meaningful technology integration must go beyond simply using a computer. Thus, today' s pre-service teachers must develop not only content knowledge and pedagogical skill, but also abilities to wisely integrate technology with these other key domains of teaching expertise. However, questions remain about pre-service teachers' self-confidence for this kind of technology integration, because of their stilldeveloping pedagogical knowledge (Koehler & Mishra, 2015). Pre-service teachers have the combined challenge of learning about educational technologies, learning about pedagogy, and learning the content knowledge. These different knowledge domains are all essential for effective technology integration (Graham, Borup, & Smith, 2014). At the same time, teachers' beliefs, and specifically their self-efficacy for teaching with technology, have a substantial impact on their decisions of whether or not to use digital technology (Ertmer, 2015).

Though literature revealed that much has been written about the general use of digital technology and multimedia resources by pre-service teachers, secondary teachers and students in Nigeria, personal factors affecting pre-service" use of technology for teaching have not been well researched into. It was on this premise that the study investigated whether the pre-service Biology educators perceived usefulness of Digital Technology for teaching may influence the extent of their use of digital technology for instruction with the aim of proffering solution to the identified problem in order to enhance teaching quality and effectiveness.

1.3. Aim and objectives of the Study

The aim of this research work is to investigate the perceived usefulness, ease of use and acceptance of digital technologies for instruction amongst pre-service Biology teachers in Niger State. Specifically, the study investigated the following objectives:

1. Determine the perceived usefulness of digital technologies for instruction amongst University Pre-service Biology teachers in Niger State.
2. Examine the perceived ease of use of digital technologies for instruction amongst pre-service Biology teachers in Niger State
3. Determine the extent of acceptance of digital technology for instruction amongst pre-service Biology teachers in Niger State.
4. Examine the perceived usefulness of digital technologies for instruction amongst males and females University Pre-service Biology teachers in Niger State
5. Determine the perceived ease of use of digital technologies for instruction amongst males and females pre-service Biology teachers in Niger State

1.4. Research Questions

The study answered the following questions

1. What is the perceived usefulness of digital technologies for instruction among University Pre-service Biology teachers in Niger State?
2. What is the perceived ease of use of digital technologies for instruction amongst pre-service Biology teachers in Niger State?

3. What is the extent of acceptance of digital technology for instruction amongst pre-service Biology teachers in Niger State?
4. Is there any difference in the perceived usefulness of digital technologies for instruction amongst males and females University Pre-service Biology teachers in Niger State?
5. What is the difference in the perceived ease of use of digital technologies for instruction amongst males and females pre-service Biology teachers in Niger State?

1.4.1. Research Hypotheses

1. There is no significant difference on the perceived usefulness between male and female university pre-service teachers in Niger State.

2. There is no significant difference on the ease of use of digital technologies between male and female university pre-service teachers in Niger State.

1.5. Significance of the Study

The study was actually expected to be of great benefits to the pre-service biology teachers, students, health sector, policy makers and the governments among others. The study will be beneficial to the students who actually needs to learn to manage and balance their time so as to be great contributors to the development of the society. The use of digital technologies will help the students greatly in the aspects of watching videos of what they' ve been taught in the class. The results from this study should offer the recommendations and influences to improve the quality of teaching in Biology education programs at the secondary school level. This study may enable teachers of secondary Biology education to learn insight on how to do a better job teaching their classes in order to enhance the achievement of their educational goals and objectives. Educational administrators, planners, and decision-makers in secondary schools

should find the information generated useful in gaining better insights into the current instructional strategies and how to modify them for greater effectiveness of the teaching-learning process. The recommendations offered by the study should go a long way in helping teachers use appropriate instructional techniques to improve student performance and learning skills.

Digital technology is also relevance in the Health Sector in so many ways. Digital technologies are being used to improve health information systems from the community level to district, national and even global levels. Their use also improves the timeliness and accuracy of public health data collection, reporting and facilitates disease monitoring and surveillance. Electronic medical records allow doctors to manage patient problems, such as chronic disease, more effectively, as well as improving office efficiency. EMR use resulted in health care system level benefits, such as reduced duplicate tests and adverse drug events, valued at $623 million in 2016.

Mobile technology can empower patients by giving them more control over their health and making them less dependent on HCPs for health information. They can use digital technology to research information online, share experiences and identify treatment options

A number of industry analysts have observed that increased accessibility of treatment is one of the most tangible ways that technology has changed healthcare. Health IT opens up many more avenues of exploration and research, which allows experts to make healthcare more driven and effective than it has ever been.

With digital technology, patients achieve better treatments, the hospitals get better equipment and medicine. It is no secret that as we move further into the age of technology, a number of benefits emerging. Many would consider that improved healthcare is the greatest result to come from

technology. Better equipment has allowed doctors to provide more comprehensive care. Better treatments have increased the quality of life of a number of different people suffering from long-term illnesses. And better medicine has completely wiped out the fear of some lifethreatening illnesses of the past. It has also helped speed up research, as well as connect medical researchers from around the world. This has allowed the focus to be narrowed and the manpower to multiplied in finding answers to certain medical mysteries. Procedures have been improved as well. For example, a medical spa in San Mateo County uses state-of-the-art technology for plastic surgery. The scope of qualified technicians and physicians has largely increased, allowing more options with safe results. Doctors can easily access a patient’s records, allowing them to provide better, in-depth knowledge about each patient’s medical past and care. Patient files used to line the halls of practices, creating large amounts of paperwork and eliminating the possibility of finding years-past medical records. Now, technology has allowed medical records to be transcribed online, easily available to both doctor and patient. Patients can feel more comfortable with their doctor when he understands their complete health picture. All of these things are due to improved technology.

It is expected that this thesis will also benefit the government. Digital transformation is now a public sector imperative. These digital technologies can help governments to understand their citizens better and achieve better outcomes, provide services more effectively and efficiently, find new solutions to policy challenges. It also assists them in engaging with external partners to develop new delivery models commercialize some public services and develop fresh sources of revenue. And yet, despite some pockets of excellence in innovation, most governments are lagging behind the corporate world in harnessing the power of digital technology. A recent report from the World Economic Forum (WEF) labels governments “the dinosaurs of the digital age:

slow, lumbering and outdated." And according to WEF's 2016 Network Readiness Index, which assesses digital advancement, the gap is widening between the growth in individuals' ICT use and governments' engagement in the digital economy.

1.6. Scope and Limitations of the Study

The study is an investigation of the perception and acceptance of Digital technology for instruction among university pre-service teachers in Niger State Nigeria. It also looked at the perceived usefulness and perceived ease of use of this digital technologies among the pre-service teachers in Niger State. The study only covered Minna and the population of the study consists mainly of pre-service Biology teachers in the department of Biology Education in Federal University of Technology, Minna, Niger State Nigeria. The variables of the work are perceived usefulness and perceived ease of use and acceptance, the study targets a total population of 200 pre-service Biology teachers. How useful the educators perceived Digital Technology, the ease of use and the influence of this perception on the extent of use of digital technology for teaching were investigated using descriptive statistics.

CHAPTER TWO

LITERATURE REVIEW

2.0. Introduction

The focus of the present chapter is to review the research work that has already done inthe area of Digital technology. It reviewed relevant literatures on the following; Education and learning, educators perceive usefulness of Digital technology, perceive ease of use of digital technology, among others.

2.1. Education and Learning

People have been finding out about their encompassing world since forever ago. The foundation of the schools as a recognizable climate for instructing and learning was made around 4000 to 5000 years' prior, a climate that next to instructors and understudies likewise included janitors and others with different undertakings, jobs and attributes that have stayed consistently (Lundgren, 2014). To sort out learning inside the school to accomplish instructive necessities, around 2500 years' prior something that today is known as the educational program was made. Through passing of some time, a curriculum was created consisting of seven subjects, divided into two groups:

(1) Trivium consisting of grammar, rhetoric and logic, and

(2) Quadrivium consisting of arithmetic, geometry, astronomy and music. The division of trivium and quadriviumcan to the current day be seen in our education despite the changes made in these subjects throughout history. Lundgren and Säljö (2014) describe the division between humanities/liberal arts and natural sciences to be a legacy from those eras.

How education is shaped and what it includes is strongly connected to the structure and development of a society's economic, cultural and social systems. Within each educational level, what should have been learned and what is to be taught are influenced by two things:

(1) What is worth knowing? and

(2) What is the social significance of this knowing? (Lundgren, 2014). Lundgren (2014) argues education is driven by ideological documents specifying what the purpose of the education is, as well as by the surrounding environment defining what knowing and knowledge is. As can be noted by the brief history above, there is a historical inheritance for each subject curriculum and educational system. The development of the Western culture has shaped various understandings of what education is and what is essential within education, all of which can be identified in various discussions related to school, education and learning (Lundgren, 2014).

2.1.2. Education, Teaching and Technology

Digital Technology is one of the school's showing apparatuses, expected to accomplish the school's points. Glancing back at the historical backdrop of innovation and training, (Bates, 2015) takes note of that advances' part in schooling returns at any rate 2500 years. Oral correspondence was the soonest methods for instruction and over the long run, as different advances have been created, innovations have progressively been utilized to work with or support oral correspondence. Before any innovation, to learn, one needed to retain by tuning in and not perusing. Transmission of information and data was simply by recitation however not composition. In about fifth century BC, composed archives were presented in antiquated Greece. In about twelfth century, record sheets were utilized in India, while writing boards/blackboards

were at first utilized in schools in Western nations around the eighteenth century. Overhead projectors were utilized before the finish of World War Two (1950s) for preparing by the U.S Army and later turned out to be usually utilized for addressing until about the1990s when programming, for example, PowerPoint was presented. Sound conferencing utilizing phones, which has existed since the 1870s however never turned into a significant apparatus in instruction, was first utilized around the 1970s to help different sorts of media. Video conferencing with devoted link frameworks and explicit meeting rooms have been utilized since the 1980s.

From the get-go in 2000, packed video innovation and minimal expense video workers upheld address catching frameworks and study hall address streaming (Bates, 2015). In accordance with Bates (2015), (Laurillard, 2012) likewise addresses the solid connection among instruction and innovation. She perceives advancements as being significant drivers for training, despite the fact that most innovations utilized in instruction have not been explicitly created for instructive purposes. Instruction, regularly, doesn't drive innovation creations Digital Technologies and Education (Laurillard, 2012), rather, advances are for the most part produced for military and business purposes (Bates, 2015). Laurillard (2012) takes note of that perhaps the main advances in human turn of events, in particular the capacity of composing, was imagined for business and not for instruction. The customary printed book, which has for quite a long time empowered acquiring, putting away, communicating and conveying information, was initially developed for getting the message out of religion and not to teach (Laurillard, 2012).

Bates (2015) stated that advanced innovations are regularly basically added to the schools and the manner in which they as of now get things done. Christensen and associates (2008) add that the manners by which advancements are brought into homerooms just barely improves the

manner in which the educators instruct and the manner in which the school is run, always failing to permit the schools to completely profit by the developments.

2.1.3. The Technology Acceptance Model

The TAM hypothesizes that, when clients are given another innovation, numerous elements impact their underlying acknowledgment however two key elements, seen convenience (PU) and saw usability Pre-administration instructors' disposition towards ICT use (PEU) assume a huge part in their proceeded with acknowledgment and selection (Davis, 2005). Davis (2005) was of the view that when innovation is seen to be helpful and simple to utilize, these insights brings about uplifting perspective towards the acknowledgment and utilization of the innovation. This proposes that, client’ s mentality towards ICT is controlled by the joint impact of apparent advantages of the innovation and saw endeavors needed by them to utilize the innovation. Davis (2005) characterized apparent value (PU) as "how much an individual accepts that utilizing a specific framework will upgrade their exhibition," while saw usability (PEU) alluded to "how much an individual accepts that utilizing a framework would be liberated from exertion. Seen value is discovered to be the most grounded factor affecting selection while saw usability to be an immediate determinant of saw handiness (Davis et al, 2005). This implies that, the less exertion a framework requires, at that point the more that utilizing it can build work execution. Then again, saw convenience has been found to affect Attitude Towards use (ATU) and goal to utilize (Teo and Schalk, 2009). ATU alludes to as the evaluative impact of negative or good sensation of the person in playing out a specific conduct (Ajzen and Fishbein, 2012) and has been distinguished as a factor that guides future conduct. Together, PU and ATU establish a critical impact on Behavioral Intention to Use (BIU), which thus influence the Actual System Use.

2.1.4. Educators' perception of usefulness of Digital technology for instruction

Discernment is the aftereffect of people acquiring information through seeing, hearing or through different faculties. Discernment is a quick or natural acknowledgment, comprehension or knowledge (Bluff, 2011). In this examination, seen convenience is characterized as the capacity of the instructors to see, imagine, acknowledge or go to the comprehension of the worth, pertinence, helpfulness and sway (or something else) of Digital Technologies in upgrading informative arrangement and conveyance. From the writing audited (Shen et al, 2014), it was discovered that impression of the handiness of innovation in supporting study hall work is compelling and the conviction that an educational advancement should offer „"added value"" far in excess of existing informative practice is significant in deciding its acknowledgment, selection and use.

New ways to deal with educating must likewise be viewed as viable with existing practices and be seen as addressing a need (Harrison, 2012). Another investigation that set up that educators will be slanted to utilize innovation on the off chance that they see it to be valuable, is that of (Tella*et al* 2010) who analyzed teachers" utilization of Digital Technology and suggestions for additional improvement of Digital Technology use in Nigerian schools utilizing an enumeration of 700 instructors drawn from 25 purposively chose private auxiliary schools in Ibadan, Oyo State. Their discoveries showed that most instructors saw the utilization of Digital Technology in educating as a valuable informative development. On saw convenience of innovation, research shows that instructors who have a high incentive for instructive innovation and see it to be valuable totally change their educating (Tella*et al*, 2011. Kumar *et al*. (2008) researched the impacts of innovation acknowledgment builds on real utilization of PC (AUC) among 318

instructors in Malaysia and announced a huge constructive outcome between saw helpfulness and real utilization of PC by the educators. The beneficial outcome brings up that as the apparent helpfulness of PC among teachers‟ builds, they experience better genuine utilization of PC. As indicated by the investigation, as instructors discover the utilization of PC innovation to be more valuable, they would be resolved to utilize it more. Seen convenience corresponding to the utilization of Digital Technology has been all around perceived as a significant factor in the achievement of Digital Technology joining in guidance.

2.1.5 Perceptions and Digital Technology Integration

There are several definitions of perception put forward by the researchers, one of which is offered by McShane and Glinow (2018). According to him, perception is the process of receiving information and making sense of the world around us. It entails deciding which information to notice, how to categorize this information, and how to interpret it within the framework of our existing knowledge. In other words, perception is the process of receiving information and stimuli from the surrounding environment, then interpreting the information and categorizing it in the framework of knowledge appropriately. Thoha (2010) argues that perception is more complex and broad compared to the sensing process because perception includes difficult interactions from selection, compilation and interpretation activities. But perception also depends on sensing which then occurs as a cognitive process of filtering, simplifying, and changing or perfecting the information received.

To be able to perceive a thing, the requirements that must be fulfilled are the perceived object, sensory device or receptor, and attention. Therefore, to be able to provide a perception about the use of Digital Technology in learning, a teacher must fulfill these requirements. According to

Mwendwa (2017), there are several factors that influence the application of computer used by teachers:

(1) pedagogical issues;

(2) familiarity with computers;

(3) teachers' training;

(4) availability of time, and

(5) availability of hard-ware and software. However, Technology Acceptance Model (TAM) developed by Davis in 1989 believes in two factors affecting someone receiving technology; namely, perceived usefulness and perceived ease of use. Perceived usefulness means the degree to which a person believes that using a technology will enhance his or her job performance, and perceived ease of use means the degree to which a person believes that the use of a technology will be free of effort (Davis et al, 1989). Although this theory had been revised several times, these two factors are still valid in understanding the use of technology. So, the definitions of teachers' perception in using Digital Technology used in this research is the teachers' acceptability of using Digital Technology in their teaching, compile the knowledge about Digital Technology, interpret it and then implement the use of Digital Technology in their language teaching. The indicators used are perceived usefulness and ease of use. Many studies have echoed similar findings related to teachers' perception towards Digital Technology integration.

Despite the variation regarding the relationship between perceptions and teachers' demographic profile such as age, gender, teaching experience and Digital Technology training, studies reveal that pre-service teachers have relatively positive perceptions toward the use of Digital Technology in learning activities (Gebremedhin, 2016). There are many factors affecting teachers' perception towards the use of Digital Technology in teaching and learning process, such as professional competency, perceived benefit, and cooperation among teachers (Yamaguchi and Takada, 2018).

2.1.6. Pre-Service Teacher Preparation

Groundwork for the training calling should accomplish the goals of the instructive interaction while likewise tending to the difficulties that face the present educators. Appropriately getting ready understudies for the encouraging calling requires the arrangement of preparing that benefits understudies and the overall local area. In this way, it is critical to zero in on different scholastic, proficient, and social perspectives inside instructive organizations to get ready educators before administration, just as to give preparing and proficient improvement during administration. Furthermore, regardless of whether educators graduate with a variety of information and abilities relies upon what they realized during these projects, which implies instructor schooling program personnel assume a huge part in getting ready pre-administration instructors (Borman & Frederick, 2009).

For generally the most recent twenty years, instruction in the United States has underlined educators' capacities and abilities to meet "the changing requirements of understudies who are both progressively assorted and energized as for their financial status" (Borman *et al*, 2009). Hence, the present educators face colossal strain to address understudies' 21st century needs to

set them up for their prospects (Borman *et al*, 2009). Likewise, elective ways are being carried out to plan instructors scholastically, and this is reflected in understudy commitment and accomplishment. Nonetheless, such endeavors are as often as possible hampered by monetary contemplations and the accentuation in the United States on government sanctioned testing.

During seasons of downturn, training is regularly the main region to see financing cuts.
Likewise, training in the United States has underlined government sanctioned testing scores and results as a way to measure institutional achievement or disappointment

2.1.7. Advanced Technology in Pre-Service Teacher Education

Since the coming of the accessibility of PCs and the Internet in schools, getting ready instructors in innovation has become a center objective of educator prep programs. For instance, "PC labs were set in universities of training to guarantee pre-administration instructors had vital specialized abilities to utilize PCs in the homeroom, yet it before long came to be unmistakable that specialized expertise didn't naturally convert into study hall reconciliation" (Lambert & Gong, 2010). In fact, pre-administration instructor arrangement in innovation has become an essential focal point of numerous school educator training programs. In this way, colleges have started to make "mix techniques across all training courses trusting that workforce demonstrating would better plan pre-administration educators with mechanical abilities and rouse more study hall innovation use" (Lambert & Gong, 2010).

Accordingly, in 2010, another arrangement was introduced for changing U.S. instruction through the compelling utilization of innovation. To stay current, the NETP is refreshed generally at regular intervals, remembering a refreshing of the proposition for how to best foster educating

and understudy accomplishment through the compelling utilization of innovation (United State Division of Education, Office of Educational Technology, 2017). Generally, the principal objectives of the first NETP have been kept up throughout the long term. These include:

a. moving away from addressing whether innovation ought to be coordinated into instruction and toward the presumption that schooling is improved by such computerized apparatuses, implying that fusing innovation ought to be a provided to best serve understudies
b. giving admittance to mechanical devices to educators and understudies to give understudies more alternatives in regards to what and how they realize
c. planning instructors to be capable in the utilization of innovation to accomplish better learning results
d. guaranteeing that each study hall is associated with the Internet by means of a fast association
e. creating connections among students, educators, friends, and guides in learning spaces
f. making accessible great online assets and instructive programming that can be utilized to evaluate the requirements and capacities of individual students (United State. Branch of Education, Press Office, 2016).

2.1.8. Barriers and enablers to technology integration in the classroom

Lloyd (2015) talked about the meanings of innovation mix. She proposed that "combination" was utilized reciprocally with "use" in the writing, and subsequently innovation coordination covered wide going situations from educator evidence courseware to consistent utilization of innovation to the degree in which Digital Technology evaporates out of spotlight of the study hall, and is the setting instead of the substance for learning. This examination uses the last definition while talking about innovation mix in the homeroom, accordingly embracing Jonassen's (2008)

learning with innovation thought. In 2001, Cuban scrutinized the contemporary reason that furnishing schools with innovation would perpetually bring about high innovation utilization in study hall instructing and learning. In a quantitative report that pre-owned information from interviews with educators, understudies, and directors, homeroom perceptions, an audit of school records and overviews of instructors and understudies in two secondary schools he tracked down that, in spite of conviction, admittance to hardware and programming only sometimes prompted far reaching instructor and understudy use (Cuban & Peck, 2001).

2.2 Theoretical frameworks

2.2.1 Teaching and Learning with or from Technology

This part sums up the learning hypotheses that have been appeared to have the best effect on innovation use in training, as demonstrated by Ertmer and Newby (1993). They support Jonassen's concept of taking in with instead of from innovation (Jonassen, 2008), which is a structure that supports this examination. This part starts with an outline of objectivist (behaviorist) models of learning, trailed by the constructivist worldview. With every hypothesis, the employments of Digital Technologies are considered according to the model of getting the hang of being talked about (objectivist/constructivist).

Objectivist philosophy (the idea of the real world, the suppositions held about the actual world) has faith in the presence of a goal genuine outer to the student (Ertmer & Newby, 1993). Epistemologically (the idea of information and thought) talking, it accepts that all students acquire a similar comprehension of this goal reality (Jonassen, 1991). Behaviorism, a part of objectivism, hypothesizes that learning happens when an understudy gives the appropriate reaction to a particular natural improvement (Ertmer & Newby, 1993). Skinner proposed operant molding: that is, corresponding to instructing, the educator remunerates the ideal demonstration

and subsequently the ideal reactions are bound to repeat later on (Standridge, 2002). Ertmer and Newby (1993) clarified that behaviorists accept that the student is receptive to conditions in the climate, instead of playing a functioning job in finding it. They additionally said that the brain or memory are not tended to by behaviorists – learning is the procurement of propensities, however how these propensities are put away or reviewed for some time later isn't examined. Behaviorism best clarifies kinds of discovering that include the review of realities, speculations (characterizing and outlining ideas) affiliations (applying clarifications) and anchoring (programmed execution of a predetermined system) (Ertmer & Newby, 1993). Notwithstanding, social standards can't enough clarify the securing of more significant level abilities or those that require a more noteworthy profundity of preparing like language improvement, critical thinking, deduction creating, and basic reasoning (Schunk, 2008).

It very well may be seen that early PC use in instruction depended on behaviorist hypotheses: PC use in 1970s training included mostly Computer Based Learning (CBL) or drill and practice programming (Ertmer & Newby, 1993). The CBL programming contains the outer realities or cycles that are to be obtained by the student and it has an accentuation on delivering discernible and quantifiable results in understudies. It can perform pre-evaluation of understudies to figure out where the guidance should start (student examination) and it underscores the dominance of the early strides before movement to more mind boggling levels of execution (sequencing of informative show, authority learning). It likewise utilizes support to affect execution, like the granting of focuses or stamps (unmistakable prizes, educational input) and the utilization of signs, molding and practice to guarantee a solid improvement reaction affiliation (easy to complex sequencing of training, utilization of prompts) (Ertmer & Newby, 1993).

2.2.2. Learning with Software website

Learning with Software website (1996) suggested that with the use of software in learning, but it focused more on pedagogical strategies of incorporating Digital Technology in teaching:a) Rotational use of computers,

b) Needs only basis,

c) Computer as reward,

d) Computer use on contract,

e) Computer as electronic blackboard,

f) Integrating the computer,

g) Computer as surrogate teacher,

h) Computer as cognitive tool.

Sandholtz*et al.*, (2007) worked on 'Teaching with technology, creating student-centered classrooms'. They reported that there were positive changes in student attitude. Their interest and motivation typically extended to the last week of school and as students became involved in working on computers, the time they spent on assignments and projects often increased. Students' enthusiasm and interest resulted in greater on-task behavior and they were highly involved in their assignment and frequently able to work with little assistance.

El-Hindi (2008) conducted study on 'Constructivist teaching with Internet'. He assumed that learning through the Internet is very compatible with constructivism. Constructivism assumes that learners are active and curious and the process of knowledge construction on the Internet is in keeping with these paradigms. The Internet is a powerful resource to support learners' natural curiosity. The Internet rethinks the idea of the teacher as the sole source of knowledge, by providing a vast world of information. He found that by using the Internet, teachers can focus

less on being the centre of learning and allow for more discoveries on the part of the student. Instead of being passive recipients listening to their teachers, students can devise their own ways of gathering information. Effective use of the Internet can help teachers move toward facilitating constructivist learning environments.

The need for computer training is explained by the fact that most of the presently recruited teachers received little or no training in their formal education concerning use of computers in teaching. It could also be a reflection of the need to update teachers' knowledge in the world of fast moving technology of communication. Training all teachers on the educational use of computers gains special importance when considering integrating the computer into regular curriculum. Teachers need to know how to use computers first before they can integrate them in the curriculum. This could make Digital Technology innovation simple to adopt and implement as the innovation becomes compatible with the current objectives of the users.

2.3. Empirical Studies

Empirical research is based on observed and measured phenomena and derives knowledge from actual experience rather than from theory or believes. An Empirical literature review is more commonly called a systematic literature review and it examines past empirical studies to answer a particular research questions. The Empirical reviews related to the thesis are as follows:

A study by Garofalo (2013) aimed at finding out the attitude of pre-service teachers in the use of digital technology for teaching, a quantitative cross-sectional survey design aimed at providing data useful for the testing the proposed hypotheses was employed. The participants for this study consisted of 400 pre-service teachers from two Ghanaian publicly-owned Colleges of Education who were undertaking a 3-year Diploma in Basic Education. In order to give all the respondents

an equal opportunity for being selected, a random sampling strategy was adopted to select the respondents. And the result revealed that pre-service teachers who showed positive attitudes towards Digital Technology felt more comfortable with using Digital Technology, and more inclined to integrate it into their teaching. In another study in Singapore’ s pre-service teacher educational context, Leo (2017) concluded that a negative attitude towards Digital Technology was a deterrent to using by the pre-service teachers in the learning environment. The implications of the findings from these studies are that, searching for factors that might best facilitate change in pre-service teacher’s attitudes at the initial stages of Digital Technology adoption should not be overlooked.

Izzet and Ozkan (2008) in a material science point pointed toward looking at the impacts of Computer Assisted Instructional (CAI) methodology and customary strategy for educating; their discoveries uncovered that the understudies educated with CAI perform better compared to those educated with conventional guidance (Izzet&Ozkan, 2008). Also, different specialists discovered comparative outcome (Satyaprakasha&Sudhanshu, 2014). Unexpectedly, Cetin (2007) tracked down that the gathering educated with customary encouraging technique performs better compared to the treatment bunch showed utilizing CAI.

Valentine (2017), dealt with 'Ways to deal with preparing and improvement', he utilized. The examination focuses on that powerful learning happens when the faculties are animated and that Online guidance, for example, computerized innovation permits students to utilize their tangible frameworks to enroll the data as sensations. He tracked down that by far most of information held by grown-ups (75%) is learned through seeing. Hearing is the following best (about 13%)

and different faculties - contact, smell and taste represent 12% of what they know. This were accomplished utilizing computerized innovation.

In 2002 Means and Olsen of the United State Department of Education's Office of Educational Research and Improvement explicitly explored the impact of innovation on constructivist instructing in homerooms. The examination noticed that expanded innovation utilize influenced schools emphatically, explicitly in the space of understudy inspiration and scholarly execution. In particular, seven out of eight areas revealed lower 26 higher understudy participation rates, five out of eight announced higher grades, and eight out of eight detailed less disciplinary episodes. Rick Kee (2012), his study analyzes teachers' perceptions of technology use in the classroom by surveying those who participated in the TeachUp! technology empowerment program created and developed by Digital Opportunity Trust United State of America, Inc. (DOT USA). The study employed the use of descriptive survey and the results show that teachers who were part of DOT USA' s TeachUp! Program perceived a significant increase in the areas of student engagement, student excitement, student acceleration of learning, and student proficiency with computer technology. The analysis has indicated that faculty members need not only to learn how to use technology at a basic level but also to learn how to integrate that technology into their curricula. In addition, newer teachers from digital native generations must be taught how their acquired skills can be used to integrate technology into the classroom curriculum to provide complex cognitive engagement for their students. It is essential that the role of the teacher as a professional in the classroom not be discounted when evaluating classroom curriculum development and strategy, including those that would integrate various technologies.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Research Design

The study employed a descriptive quantitative survey method in investigating the perceived usefulness, ease of use and acceptance of digital technologies for instruction amongst pre-service Biology teachers in Niger State. The design was suitable for the study since data will be collected through questionnaire. The target population for the study was the pre-service University Biology teachers in Niger State.

Creswell (2013) stated that research designs are plans and procedures for research that span the decisions from broad assumptions to detailed methods of data collection and analysis. A research design provides the basic directions or recipe for carrying out the research project. Research design is necessary for fulfilling research objectives. Creswell (2013) states that there are five types of research designs, which are:

I. Exploratory;
II. Correctional;
III. Explanatory;
IV. Descriptive; and
V. Casual-comparative.

3.2.Population of the Study

Johnson and Christensen (2012) referred to the target population as the entire group of people, events or things of interest that the researcher wishes to investigate. It is a specific group for which a researcher wants to make inferences. The target population for this study will be the pre-

service teachers in Federal University of Technology, Minna, Niger State who has gotten an NCE certificate before proceeding to the University. This indicates that the target population comprised of 240 university pre-service Biology teachers from 300 level to 500 level students of science education department, Federal University of Technology Minna, Niger State.

3.2. Sample size and Sampling Techniques

The sample size of one hundred and fifty respondents was used. A stratified random technique was used to select the sample size of the study. The researcher used Taro Yamane's formula to determine the sample size from the population.

Taro Yamane's formula is given as;

WhereN = Population of study (240)

n = Sample size (?)

e = Level of significance at 5% (0.05)

1 = Constant

$$\text{❖} n = \frac{240}{1+240\ (0.05)^2} = \frac{240}{1+240 \times 0.0025} = \frac{240}{1+0.6}$$

$$n = \frac{240}{1.6} = 150$$

The sample size therefore is 150 respondents.

3.4 Research Instrument

The instrument used for the collection of data was a structured questionnaire designed foreliciting information on teacher's perception on the use of digital technologies in science classrooms. The questionnaire is made up of section A, B, C and D. Section A contains the demographic data, section B which sought to find out respondents' perceived usefulness is made up of 10 items, Section C which also sought to find out the perceived ease of use of respondent is made up of 9 items, section D is also made up of 9 items and it sought to find out the extent of acceptance of digital technology of respondents. Questions was dignified making use of fourpoint scale response format SA = Strongly Agree (4), A = Agree (3), D = Disagree (2) and SD = Strongly Disagree (1), as well as High, Moderate, Low, Very Low for the extent of acceptance.

3.4.1.Validity of the Instrument

Validity is an essential quality that measures the extent to which an instrument accurately measures what it intends to measure. Validity refers to the appropriateness, meaningfulness, and usefulness of the specific inferences made from the test scores If an instrument lack validity, it results to useless information (Akande&Kolo, 2009), The structured questionnaire is the instrument for this thesis. The validity of the instrument was established by the judgment of experts and experience competent project supervisor. This was presented to the researcher's competent supervisor for his comments, suggestions, approval, and recommendations which was incorporated for the improvement of the tool for the study.

3.4.2. Reliability of the Instrument

The Cronbach's alpha test was used to determine the reliability of the instrument. A coefficient level of 0.81 was obtained and this indicated that the research instrument was actually reliable A coefficient value of 0.81 can be considered because according to Etuk (1990).

The formula for Cronbach's alpha is:

$$\alpha = \frac{N \cdot \bar{c}}{\bar{v} + (N-1) \cdot \bar{c}}$$

Where:

N = the number of items.

$\bar{c}$ = average covariance between item-pairs.

$\bar{v}$ = average variance.

3.5 Method of Data Collection

At the University, the researcher will introduce herself to the pre-service teachers and then brief them about the purpose of her visit. The researcher then will randomly select the number of Biology pre-service teachers needed for the study; administer the questionnaire to them and brief explanations regarding how they were to respond to each question will be illustrated. So the method of data collection is by questionnaire.

3.6 Method of Data Analysis

Data analysis is a way of gathering, modeling and transforming data with the aim of highlighting information. Data obtained through questionnaires, interviews and observation or through secondary sources need to be analyzed for deductions to be made (Israel 2015). A software called SPSS version 22.0 was used to analyze the data collected from the responses. The results will be presented in the form of descriptive statistics.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Introduction

This chapter discusses the interpretation and presentation of the findings. This chapter presents analysis of the data on perception of digital technologies for instruction among university pre-service Biology teachers in Niger State. The chapter also provides the major findings and results of the study.

4.2 Response Rate

The researcher targeted 240 respondents who were part of the university pre-service Biology teachers in Science Education department in Federal University of Technology, Minna, Niger State. This is because the people in science department are the most conversant with the subject matter of the study. However, out of 150 questionnaires distributed, 150 respondents completely filled in and returned the questionnaires, this represented 100% response rate. This is a reliable response rate for data analysis as Mugenda (2003) pointed that for generalization a response rate of 50% is adequate for analysis and reporting, 60% is good and a response rate of 70% and over is excellent.

4.2.1Background Information

The study sought to establish the general information of the respondents including their gender and age.

Table 1: Frequency and Percentage of Respondents based on Gender

Gender	Frequency	Percentage (%)
Male	90	60
Female	60	40

The table above shows the frequency and percentage of respondents based on gender. The study revealed that the total number of female respondents was 60 which accounts for 40% of the total population, while the total number of male respondents was 90 which accounts for 60% of the total population. This study is further highlighted in a Pie chart.

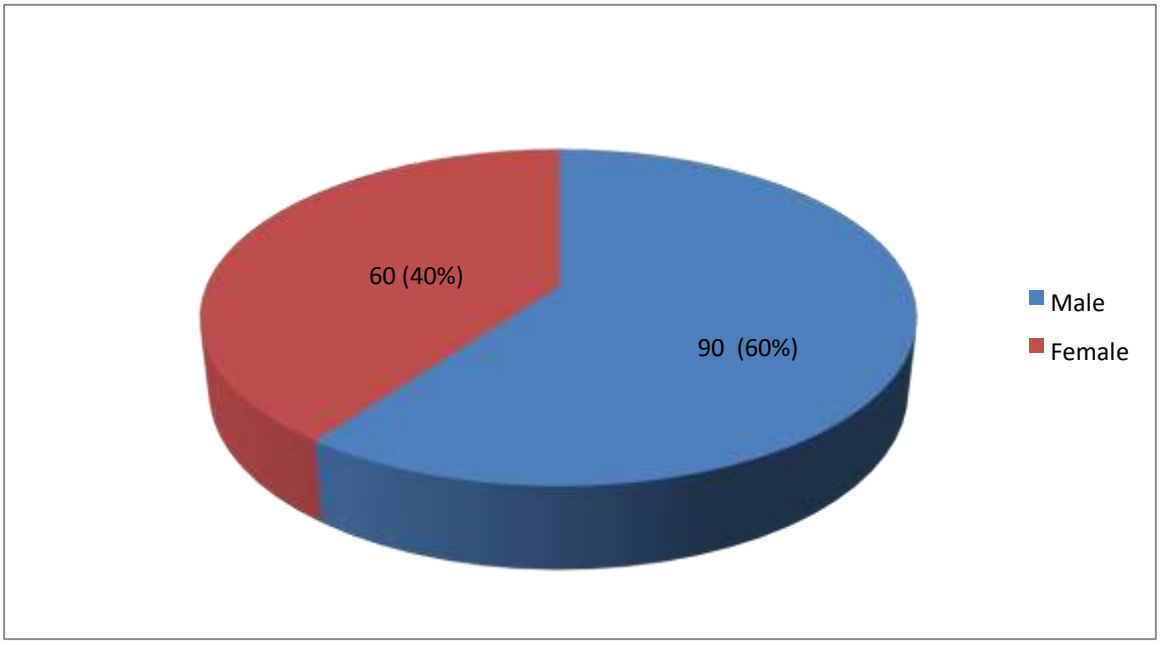

Figure1: Respondents Gender

Table 2: Distribution of Respondents based on Age

Age	**Frequency**	**Percent**	15 - 20 Years	34	22.70
21 - 25 Years	67	44.60			
26 Years and above	49	32.70			
Total	**150**	**100.0**			

The Table above shows the respondents age, the study found that 34 (22.7%) of the respondents were in the range of 15-20 years, 67 (44.6%) of the respondents' ages were within the range of 21 - 25 years, while 49 (32.7%) of the respondents' ages were 26 years and above. This data is further represented on bar chart as shown below.

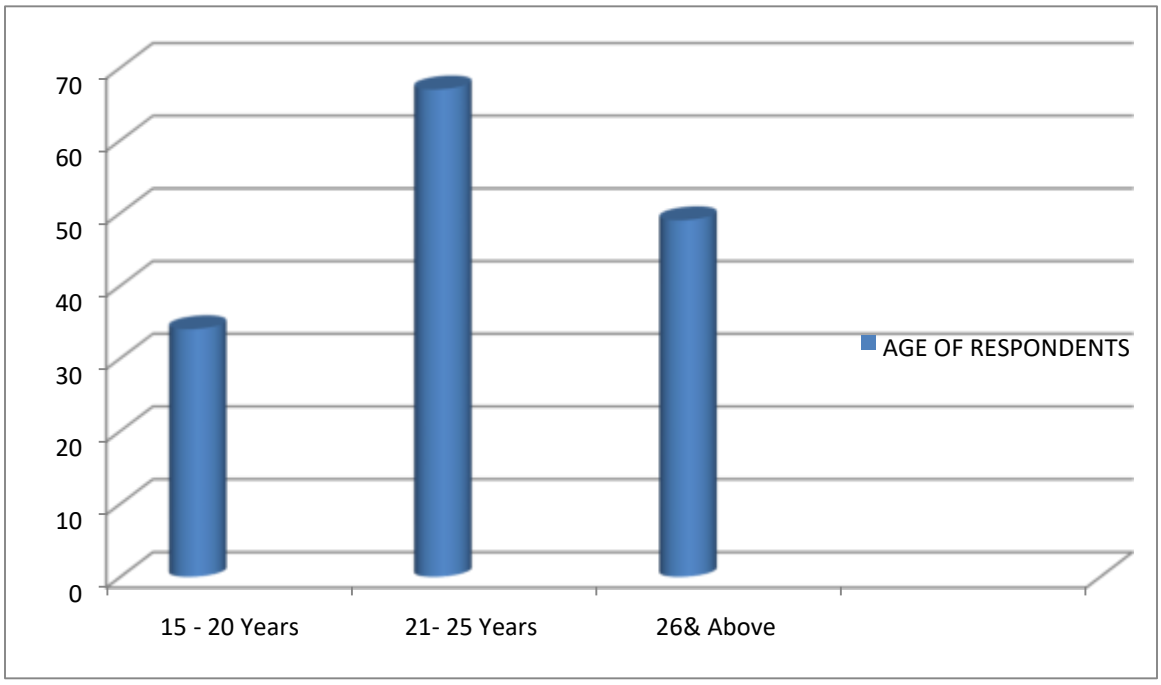

Figure 2: Age of Respondents

4.3 Examination of results in accordance with the research questions

4.3.1 Research question 1: What is the perceived usefulness of digital technologies for instruction among University Pre-service Biology teachers in Niger State.

S/N	Statement	N	Mean	S.D	Decision
1.	The use of Digital Technology can make learning Process more effective	150	3.62	.98	Positive
2.	I do not feel that the use of Digital Technology has given benefits to me as a teacher.	150	1.44	.74	Negative
3.	The use of Digital Technology can increase Students' motivation	150	3.26	.94	Positive
4.	The use of Digital Technology can improve my teaching performance	150	2.91	.90	Positive
5.	The use of Digital Technology can foster positive attitudes of students towards learning.	150	2.79	.88	Positive
6.	The use of Digital Technology can create various learning activities.	150	3.66	.99	Positive
7.	The use of Digital Technology can make the students have a better understanding of how technology affects their lives	150	2.66	.84	Positive
8.	The use of Digital Technology is as important as the use of textbooks for students	150	2.6	.85	Positive
9.	I do not feel that the use of Digital Technology can help me learn new skills.	150	1.41	.69	Negative
10.	The use of Digital Technology can make learning activities more interesting and enjoyable	150	2.81	.89	Positive
	GRAND MEAN	**150**	**2.72**	**.87**	

Source: Researcher's Field Survey, 2021

To answer the research question 'what are pre-service teacher's perceptions toward the use of Digital Technology in learning activities?" a questionnaire consisting of 10 statements was distributed, collected and analyzed. This was further presented in tables, the mean and standard deviations of respondents were recorded. The perceptions of pre service Biology teachers towards the use of Digital Technology in learning activities in terms of the Perceived Usefulness is represented in Table 3.The average mean of 2.5 was used as the benchmark for positive perception and the mean of below 2.5 is considered as negative perception.

Table 3 show that in terms of the perceived usefulness, the perceptions of pre-service teachers on the use of Digital Technology in learning activities is very good. Respondents has positive notion that the use of Digital Technology can make learning process more effective as this has a mean of 3.62 and standard deviation of 0.98. A greater percentage also supported that the use of Digital Technology can increase students' motivation, foster positive attitudes of students towards learning, and can make learning activities more interesting and enjoyable. One very interesting thing is that almost all pre-service Biology teachers agree that the use of Digital Technology can make the students have a better understanding of how technology affects their lives. Regarding the benefits, the teachers agree that the use of Digital Technology can improve teaching performance and can help them learn new skills by rejecting the statement which says that 'I do not feel that the use of Digital Technology can help me learn new skills. The table also shows that respondents rejected the statement 'I do not feel that the use of Digital Technology has given benefits to me as a teacher' with a benchmark of below 2.5.

4.3.2 Research question 2: What is the perceived ease of use of digital technologies for instruction amongst pre-service Biology teachers in Niger State?

Table 4: Perceived Ease of use

S/N	Statement	N	Mean	Standard Deviation	Decision
1.	The use of Digital Technology provides convenience in communication.	150	3.95	1.2	Positive
2.	The use of Digital Technology provides convenience in monitoring students' learning progress.	150	2.85	.90	Positive
3.	The use of Digital Technology provides convenience in controlling students' activities	150	3.12	.92	Positive
4.	The use of Digital Technology in learning activities is quite easy and is not troublesome.	150	3.03	.91	Positive
5.	I have enough experience to cope with the use of digital technology	150	2.71	.81	Positive
6.	The use of Digital Technology makes it easy for teachers to explain the concept of the lesson	150	2.62	.82	Positive
7.	Teaching using digital technology is not difficult, I seem to like it.	150	3.73	1.0	Positive
8.	My knowledge of digital technology and skills makes achieving learning objectives easier and accurate	150	2.79	.88	Positive
9.	The use of Digital Technology provides convenience in assessing the students' progress	150	3.26	.94	Positive

GRAND MEAN	**150**	**3.12**	**.93**

Source: Researcher's Field survey, 2021

Based on Table 4, it is noticeable that when viewed from the ease of use, the perception of Pre-Service Biology teachers on the use of digital Technology in learning activities is very good. The teachers agree that the use of digital Technology in learning activities is quite easy as all responses were positive. The use of digital Technology also provides convenience in meeting the needs of learning resources; it also gives an ease to explain the concept of the lesson, an ease to monitor students' learning progress and an ease to control students' activities. Although the use of digital Technology has caused a lot of technical problems, the teachers agreed that the use of digital Technology provides convenience in assessing the students' progress and storing teachers' and students' documents. Moreover, the use of digital Technology also provides convenience in communication. So in general, a total mean and standard deviation of $\bar{x}$ =3.73; SD=1.0) agreed that Teaching using digital technology is not difficult, and all respondents seems

to like it

4.3.3 Research question 3: What is the extent of acceptance of digital technology for instruction amongst pre-service Biology teachers in Niger State?

Table 5: Extent of Acceptance

S/N	Statement	N	Mean	Standard Deviation	Decision
1.	What is your level of acceptance as a preservice teacher in incorporating Digital Technology in teaching Biology?	150	3.09	.92	High Acceptance
2.	To what degree is your level of acceptance that digital technology should be used as a teaching aid frequently	150	3.09	.92	High Acceptance
3.	To what extent do you agree that digital technology has made the teaching and learning process more productive	150	3.22	.93	High Acceptance
4.	What is your level of acceptance of Digital technology	150	3.34	.95	High Acceptance
5.	To what extent do you accept that the use of digital technology has eradicated inconveniences in meeting the needs of learning resources	150	3.29	.94	High Acceptance
6.	What is your level of acceptance that the use of digital technology has made storing teacher's and student's documents effective	150	3.34	.95	High Acceptance
7.	What extent do you accept that the use of digital Technology provides convenience in assessing the learner's progress	150	3.31	.94	High Acceptance
8.	To what degree do you accept that using digital technology in class is favorable?	150	3.31	.94	High Acceptance
9.	To what extent do you agree that it is a trend to use digital technology aids in class.	150	3.17	.93	High Acceptance

GRAND MEAN	**3.24**	**0.94**

Table 5 above shows the extent of acceptance of digital technology amongst pre-service Biology teachers. The table reveals high extent of acceptance of digital technology as all responses returned positive.

4.3.4 Hypothesis 1: There is no significant difference in the perceived usefulness of digital technologies for instruction amongst males and females University Pre-service Biology teachers in Niger State.

Table 6: Summary of t-test analysis on difference in the perceived usefulness of digital technologies for instruction amongst males and females University Pre-service Biology teachers.

Group Statistics

	Gender	N	Mean	Std. Deviation	Df	Std. Error Mean	t- value	p- value	Remark
Perceived Usefulness	Male	90	21.54	5.294	148	.558	.675	0.34	NS
	Female	60	20.98	4.478		.578			

The Table 4 presents the t-square analysis on difference in the perceived usefulness of digital technologies for instruction amongst males and females University Pre-service Biology teachers. The mean of male and female was 21.54 and 20.98 respectively which is not significant, with the calculated *t* value of 0.675 (t = 0.675, df =148, p > .05). Therefore, there is no significant difference in the mean responses of male and female perceived usefulness of digital technology.

Therefore, the null hypothesis is supported and must be accepted for the items.

4.3.5 Hypothesis 2: There is no significant difference in the perceived ease of use of digital technologies for instruction amongst males and females pre-service Biology teachers in Niger State.

Table 7

Group Statistics

	Gender	N	Mean	Std. Deviation	Df	Std. Error Mean	t- value	p- value	Remark
Perceived ease of use	Male	90	17.86	5.945	148	.627	.795	0.41	NS
	Female	60	17.03	6.572		.848			

At 0.05 significance level
NS = Not Significant

The Table 5 presents the Independent Samples Test on the difference in the perceived ease of use of digital technologies for instruction amongst males and females University Pre-service Biology teachers. The mean response of male and female was 17.86 and 17.03 respectively. The findings revealed that the calculated *t* value is 0.795 (t = 0.795, df =148). Since the p-value is 0.41, the null hypothesis is accepted. This implies that there is no significant difference in the mean responses of male and female perceived ease of use of digital technology.

4.4. Discussion of findings

The study aimed at investigating the perceived usefulness, ease of use and acceptance of digital technologies for instruction amongst pre-service Biology teachers in Niger State. The importance of using Digital Technologies in learning activities cannot be ignored. That is why the government has implemented the *2013 curriculum* which is a technology-based curriculum. This government policy must be supported by all parties, especially teachers as the important persons who implement teaching and learning activities in the classroom. Teo (2008) argues that if a school wants to be a superior school, it is important to ensure that its teachers are able to

integrate technology into the curriculum. Professional teachers are teachers who continue to make changes and face the development of new technologies in their lives. As professional workers, pre-service teachers must understand their roles and functions as resources and catalysts for learning activities (Copriady, 2014). Of course, this is not an easy way. Many factors influence the success of teachers in using Digital Technologies in their teaching activities, including the perception and acceptance of teachers to use Digital Technologies in their teaching activities.

The results of data analysis in Table 3 and Table 4 show that high population of Pre-service Biology teachers agreed Positively to each of the statements given in the questionnaire except that regarding the benefits, the teachers agreed that the use of Digital Technology can improve teaching performance and can help them learn new skills by rejecting the statement which says that 'I do not feel that the use of Digital Technology can help me learn new skills. The table also shows that respondents rejected the statement 'I do not feel that the use of Digital Technology has given benefits to me as a teacher' with a benchmark of below 2.5.

This indicates that the pre-service Biology teachers have a positive perception of the use of Digital Technologies in the learning activities. This present finding is in agreement with the earlier finding of Bijeikiene, *et al*. (2011) that teachers' view towards the use of electronic learning in the classroom was positive. In addition, it agrees with the finding of Alharbi and Drew (2014) who found that academics' view towards electronic learning was positive. This positive perception arises because the pre-service teachers have seen and felt lots of values of using Digital Technologies in learning activities. Moreover, the pre-service teachers have also felt convenient when using Digital Technology in learning activities. In terms of usefulness,

more than 90% of pre-service teachers agreed that the use of Digital Technologies can make learning activities more effective, increase student's motivation, foster positive attitudes of students towards learning, make learning activities more interesting and enjoyable, and create more various learning activities and other things. Whereas in terms of ease of use, more than 90% of pre-service Biology teachers also agreed that the use of Digital Technologies provides convenience in meeting the needs of learning resources, explaining the concept of the lesson, monitoring students' learning progress, communication, as well as provides convenience storing teachers' and students' documents. This finding is in agreement with the earlier finding of Alharbi and Drew (2014) who found that academics perceived Learning Management System easy to use. The perceived ease of using virtual laboratory package by pre-service Biology teachers was because they have been using electronic means to learn some of their university courses. Therefore, it was not difficult for them to operate and navigate through the package.

In term of the extent to which pre-service teachers readily accept Digital Technology, Table 5 above shows the extent of acceptance of digital technology amongst pre-service Biology teachers. The table reveals high extent of acceptance of digital technology.

In respect to differences in the perceived usefulness of digital technologies for instruction amongst males and females University Pre-service Biology teachers in the study Area was also determined and result shows that the mean of male and female was 21.54 and 20.98 respectively with the calculated t value of 0.675 (t = 0.675, df =148, p > .05). Therefore, it was noted that there is no significant difference in the mean responses of male and female perceived usefulness of digital technology. Therefore, the null hypothesis is supported and must be accepted for the items. So, it is found that there is no statistically significant relationship between the mean

response of male and female perceived usefulness of digital technology, pre-service teacher perceived usefulness and perceived ease of use towards Digital technology. This finding supports other previous studies which found that teachers' demographic characteristics such as age, gender, teaching experience, DT training and experience do not have significant influence on teachers' perceptions and attitudes towards DT integration

The results of hypothesis two testing show that gender has no effect on responses in respect to the perceived ease of use of digital technology.

4.5 Summary of Findings

1. Result from research question shows that Pre-service Biology teachers perceived that digital technology is useful for teaching and learning.

2. Result from research question shows that Pre-service Biology teachers have high positive perception concerning the ease of use of digital technology for instruction.

3. Result from research question 3 also shows that Pre-service Biology teachers have a high acceptance of use of digital technology for instruction.

4. Result from the research questions obtained above supported the null hypothesis. Thus answering research question 4 and 5.

CHAPTER FIVE

5.0. SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1. Summary

The purposes of this research were to investigate the perception and acceptance of digital technology for instruction among university pre-service biology. In summary, the research reveals that a total of 150 respondents participated in the research, and they noted that in terms of the perceived usefulness of digital technologies for instruction among University pre-service Biology teachers, pre-service Biology teachers have a positive perception on the use of Digital Technologies in learning activities. This positive perception arises because the pre-service teachers have seen and felt lots of values of using Digital Technologies in learning activities. Whereas in terms of ease of use, more than 90% of pre-service Biology teachers also agreed that the use of Digital Technologies provides convenience in meeting the needs of learning resources, explaining the concept of the lesson, monitoring students' learning progress, communication, as well as provides convenience storing teachers' and students' documents. The research also reveals high extent of acceptance of digital technology. It was shown that there is no significant difference in the mean responses of male and female perceived usefulness of digital technology. The results of hypothesis two testing show that gender has no effect on responses in respect to the perceived ease of use of digital technology.

5.2 Conclusion

There is a gap in student's performance in core subject all over the world and specifically in Nigeria that needs to be filled. Technology learning packages as an instructional resource will help in bridging the gap. In this study it can be seen that the technology learning package has the potential to improve student's performance in all subject and. It is recommended that pre-service

teachers should be trained and encouraged to employ technological resources in their classroom practices. This study reveals that Pre-service biology teachers agreed that in term of perceived usefulness, digital technology is very useful and an easy instructional material for timely completion of lessons, sustaining students' attention and wider coverage of the course outline, digital technology should be employed by pre-service teachers (biology) to supplement conventional method of teaching in the classroom. The study further reveals that the pre-service teachers' perception on the extent of use of digital technology was also encouraging.

The use of the Digital Technology would in no doubt improve students' achievement in Biology and make pre-service teachers more efficient in teaching of the subject if proper measures are put in place.

65% pre-service Biology teachers agreed and strongly agreed to each of the statements given in the questionnaire. This indicates that the pre-service Biology teachers have a positive perception of the use of Digital Technologies in the learning activities. This present finding is in agreement with the earlier finding of Bijeikiene, *et al*. (2011) that teachers' view towards the use of electronic learning in the classroom was positive. The results of data analysis in Table 3 and Table 4 show that high population of pre-service Biology teachers agreed Positively to each of the statements given in the questionnaire except that regarding the benefits, the teachers agreed that the use of Digital Technology can improve teaching performance and can help them learn new skills by rejecting the statement which says that 'I do not feel that the use of Digital Technology can help me learn new skills. The table also shows that respondents rejected the statement 'I do not feel that the use of Digital Technology has given benefits to me as a teacher ' with a benchmark of below 2.5.

So in terms of usefulness, more than 90% of Pre-service teachers agree that the use of Digital Technologies can make learning activities more effective, increase students' motivation, foster positive attitudes of students towards learning, make learning activities more interesting and enjoyable, and create more various learning activities and other things. Whereas in terms of ease of use, more than 90% of pre-service Biology teachers also agreed that the use of Digital Technologies provides convenience in meeting the needs of learning resources, explaining the concept of the lesson, monitoring students' learning progress, communication, as well as provides convenience storing teachers' and students' documents.

This finding is in agreement with the earlier finding of Alharbi and Drew (2014) who found that academics perceived Learning Management System easy to use. In term of the extent to which pre-service teachers readily accept Digital Technology

5.2. Recommendations

Based on the findings, the following were recommended

1. Encouraging Teachers to Participate in Multimedia Teaching-Related Educational Training

2. Developers of digital technological tools should ensure that they are perceived useful and easy to use by the pre-service teachers; this would enable them to utilize it in learning biological concepts.

3. Developers of virtual-based learning environments such as Virtual Biology Laboratory Package should ensure they develop packages that are easy to use and perceived useful by pre-service teachers. This would enable them have positive attitude and intention to utilize such in teaching and learning process.

4. Administrators should equip schools with adequate Digital Technology facilities that would aid students and teachers' utilization of virtual-based learning environments such as Virtual Physics Laboratory Package in teaching and learning process.
5. The quality, not quantity, of the time allowed for technology integration into the curriculum is the key to student learning. So pre-service teachers should be observed to ensure he or she makes quality use of the time allowed for digital technology usage
6. School leaders must plan for technology and include everyone at the *beginning* of the plan, not after technology is implemented.
7. The government as a policy-maker should provide financial support for the schools to adequately provide Digital technology equipment needed in schools, as well as to prepare necessary facilities and infrastructure.
8. To apply Digital technology -based curriculum as expected by the government, it is important for pre-service teachers to continue improving their ability and enriching their knowledge related to the use of Digital technology through training, both held by schools or other institutions so that teachers can vary their teaching methods or teaching strategies.

5.4 Suggestions for Further Studies

The following suggestions were made for future research studies;

1. Positive and Negative effects of the use of Digital technology amongst Pre-service teachers in Ibrahim Badamassi Babangida University, Minna, Niger State.
2. Factors affecting the use of Digital technology amongst Pre-service teachers in Ibrahim Badamassi Babangida University, Minna, Niger State.
3. Assessing the impact of the use of Digital technology amongst Pre-service teachers in Ibrahim Badamassi Babangida University, Minna, Niger State.

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