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The Role of Mobile Technologies in Supporting Inclusive and Accessible Learning among Undergraduates in University of Port Harcourt

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ABSTRACT

The study investigated the Role of Mobile Technologies in Supporting Inclusive and Accessible Learning among Undergraduates in University of Port Harcourt. Rivers State. Two research questions were stated and two hypotheses formulated which guided the study. A descriptive research design was used in the study. The population was 1,468 of 300 level students in Faculty of Education. Multi stage sampling technique was used to draw 320 students for the study. The instrument for data collection used was "The Role of Mobile Technologies in Supporting Inclusive and Accessible Learning among Undergraduates". The instrument was validated by my supervisors and two other evaluation experts in test construction. The coefficient of reliability obtained was 0.79. Mean and standard deviation were used to answer the research questions while t-test was used to test the hypotheses at 0.05 significant level. The results showed that the level of mobile technology usage is high; educational usage of mobile technology is very high; competency level of mobile technology usage for learning is very high; students' perception of the use of mobile technologies in learning is very high; key constraints to using mobile technology for learning is also high among undergraduates in Faculty of Education. The study also found that the level of mobile technology usage showed no significant difference with gender; uses of mobile technology for educational purpose showed a significant difference with gender; the uses of mobile technology competency for learning did not show a significant difference with gender; the students' perception of mobile technology uses did not show a significant difference with gender and key constraints in the uses of mobile technology for learning among undergraduates in the Faculty of Education did not show a significant difference with gender in this study. Based on these findings, the study concluded that the use of mobile technologies for learning among undergraduates has a positive impact on the students and gender does not significantly influence mobile technologies usage among undergraduates. It is therefore recommended that the university authority should make their lectures more attractive by using modern technology to improve the skills and competencies of utilizing ICT by the undergraduates.

Keywords: Mobile Technologies, Supporting, Inclusive and Accessible Learning, Undergraduates

INTRODUCTION

Education involves the transfer of knowledge and the acquisition of various skills and character traits. It is also a process of teaching and learning, accomplished through diverse approaches. The advancement of a society significantly depends on the quality of education available. Traditionally, teachers primarily used conventional methods for instruction, but today, most educational institutions incorporate modern techniques, especially mobile technologies, into teaching. As the Nigerian Educational Research and Development Council (NERDC, 2014) highlights, the application of modern educational techniques should be continuously expanded and enhanced across all educational levels.

Recent advancements in computer and communication technology have opened up vast opportunities for learning. The use of computers and other information and communication devices has become a driving force in today's education systems. With the rise of mobile technologies, the integration of mobile devices in learning has become essential. Mobile learning, or M-learning, has emerged as a progressive method that combines the accessibility and convenience of mobile devices with the extensive reach of the internet to support teaching and learning (Shonola et al., 2016). The term "digital native," coined by Marc Prensky, describes individuals who grew up surrounded by digital technology and are accustomed to the internet from an early age. Today's students, as digital natives, benefit greatly from technology, such as when scheduling online classes when in-person learning is unavailable. Conversely, "digital immigrants" are those who were born before the digital age but have since adapted to the internet and its related tools. The current educational structure was originally designed for an analogue era and predates the internet revolution (Waterford, 2021).

Mobile devices like smartphones and tablets are increasingly popular among students, creating new avenues for communication, collaboration, and learning. These portable devices enable innovative learning approaches, allowing students to share educational messages and files with classmates, search online and library databases for academic materials, practice with quizzes or tests, and participate in discussions (Garba, 2023). Waterford (2021) describes 21st-century students as "Digital Natives" due to their immersion in a world shaped by digital technology. For this reason, it is essential to explore effective teaching methods that promote learning and enhance student performance. Consequently, with advancements in educational technology, schools should adopt a more adaptable approach to meet the needs of modern students. Studies show that undergraduate students' perceptions of satisfaction, ease of use, and accessibility significantly impact their use of mobile technology for learning in public universities (Oyewole et al., 2022). While age and gender do not substantially affect mobile technology usage, positive evaluations of accessibility, satisfaction, and ease of use independently and jointly encourage students to adopt these technologies. The study suggests that undergraduates could benefit from institutional support or funding for mobile learning tools, with additional resources like M-learning applications to provide visual and auditory tutorials.

Mobile learning (m-learning) involves delivering educational materials through mobile devices, including mobile phones, smartphones, PDAs, MP3/MP4 players, e-readers (e.g., Kindle), netbooks, tablets (e.g., iPad, Galaxy Tab), hybrid devices (e.g., Galaxy Note), and specialized portable lab technologies (Shonola et al., 2016). M-learning improves learning accessibility, efficiency, and quality by facilitating resource access across various media types, such as text, graphics, video, and audio. According to Shonola et al. (2016), students can access lecture notes and assignments through these mobile devices, which connect to university systems like virtual learning environments (VLEs) and management information systems (MIS). Mobile technologies have indeed enhanced the learning experience for teachers and students alike, streamlining research by providing diverse perspectives on any subject. The widespread use of mobile technology offers vast opportunities to support learning both within and beyond the classroom. Through mobile technology, the learning experience extends into the field, the lab, and other real-world contexts, providing flexible and continuous access to information, resources, and communication. This technology supports students wherever they are, enhancing their learning journey through its portability and constant connectivity (Shonola et al., 2016).

In the 21st century, mobile technologies encompass far more than just cell phones. Their potential applications extend across various sectors: they can manage transportation and logistics, enhance security and public safety systems, facilitate healthcare delivery, boost productivity in industrial settings, control the mechanical systems of commercial and industrial buildings, and increase consumer convenience through mobile commerce, among other uses (MTAM, 2014, as cited in Issa et al., 2018). The advancements in mobile technology, wireless communication, and network systems have been substantial, allowing these technologies to be integrated into campus environments for use by both teachers and students. Mobile technology empowers educators and learners to access computing resources anytime and anywhere, while internet and wireless connectivity enable seamless interaction between mobile devices and other computing systems, thereby supporting undergraduate learning (MTAM, 2014, as cited in Issa et al., 2018). Mobile learning utilizes technology as cognitive tools to foster a constructivist learning environment. Media clearly plays a crucial role in designing

instructional strategies, as technology can create learner-centered, interactive, and cost-effective learning resources (Ayonote-Yusuf, 2012). Mobile learning enables individuals to enjoy and engage in education through mobile devices. As an emerging educational strategy, mobile learning has grown significantly due to advancements in wireless technologies and mobile computing. However, as Kearney et al. (2012) suggest, mobile learning remains underutilized in certain educational sectors, emphasizing the need to examine pedagogies that support learning and to approach mobile learning from a student-centered perspective rather than focusing solely on technological features.

In the context of mobile learning, "mobility" refers to the ability to connect classroom learning to the external world, giving students the flexibility to learn within their own environments (Naismith et al., 2004). According to Koole's FRAME model (2009), mobile learning represents a continuous evolution that emerges from the combination of mobile technology, human learning capacity, and the social interactions that support educational experiences. The concept of "learning on the go" has become widespread, offering the potential to improve productivity by making learning accessible anytime and anywhere. Mobile learning thus facilitates opportunities for students to learn in various contexts, granting them access to abundant educational resources both inside and outside the classroom. Additionally, Joseph et al. (2007) note that mobile learning supports time- and location-independent education, enabling collaborative learning experiences. Mobile devices are accessible in diverse contexts to enrich the learning experience. They can assist learners by maintaining focus and providing support as needed. In a systematic review, Sophonhiranrak (2021) analyzed studies published from 2006 to 2018 that included keywords such as "mobile learning," "m-learning," "undergraduates," and "higher education," and concluded that mobile devices can be effective learning tools for tasks like submitting assignments, reflecting on learning experiences, and sharing ideas. For successful mobile learning, instructors should consider three key factors: the readiness of both learners and instructors, learning management, and supportive systems. Mobile devices now serve not only as communication tools but also as significant resources for economic engagement, mass communication, and educational advancement. Given the rapid growth in mobile device and Internet usage, these tools are increasingly being integrated into educational contexts (Sophonhiranrak, 2021). By the end of 2021, there were 8.26 billion mobile subscriptions worldwide, with over 5.3 billion Internet users globally. In Nigeria alone, approximately 195.13 million mobile subscriptions were recorded. In many developing countries, including Nigeria, mobile devices are the primary means of Internet access (International Telecommunication Union, 2022). Additionally, smartphones surpassed personal computers in usage in 2011, presenting educators with new opportunities to deliver meaningful learning experiences via mobile technology**.**

Statement of the Problem

Since the beginning of the 21st century, the invention and rapid adoption of the internet and mobile technologies have transformed most global industries, including the education sector. Leveraging the power and mobility of these technologies, many institutions have enhanced their operations, service delivery, and accessibility. In education, mobile technologies have improved teaching and learning, making them accessible anytime and anywhere. They facilitate classroom interactions and collaboration, allowing students and teachers to connect conveniently. These technologies have effectively brought learning to our doorsteps, making education more mobile. In Nigeria, education students are viewed as the future drivers of national growth and development, necessitating their engagement with cutting-edge learning tools. However, Nigeria's progress in aligning with global academic advancements depends significantly on the accessibility and adoption of mobile technologies in classrooms. Therefore, it is crucial to examine the extent of mobile technology use among undergraduates, particularly in terms of general usage, educational applications, gender competencies, student perceptions, and key barriers. Consequently, this study aims to assess the use of mobile technologies for learning among undergraduates in the Faculty of Education at the University of Port Harcourt.

Aim and Objectives

The aim of this study is to determine the use of mobile technologies for learning among undergraduates in Faculty of Education in the University of Port Harcourt. The objectives of this research work include to:

1. ascertain the level of mobile technology use among undergraduates in the Faculty of Education.

2. determine the educational uses of mobile technology among undergraduates in the Faculty of Education.

Research Questions

The following research questions guided the study;

1. What is the level of mobile technology use among undergraduates in the Faculty of Education?
2. What are the educational uses of mobile technology among undergraduates in the Faculty of Education?

Hypotheses

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

1. There is no significant difference in the level of mobile technology use among undergraduates in the Faculty of Education.
2. There is no significant difference in the educational use of mobile technology among undergraduates in the Faculty of Education.

LITERATURE REVIEW

Conceptual Framework

The Concept of the use of Mobile Technology

A mobile device is a general term for any type of handheld computer. These devices are designed to be extremely portable, and they can often fit in your hand. Some mobile devices like tablets, e-readers, notebooks and smartphones are powerful enough to do many of the same things you can do with a desktop or laptop computer (GCFGlobal, 2019). According to Goyal (2021), Mobile technology is a type of technology in which a user utilizes a mobile phone to perform communications-related tasks, such as communicating with friends, relatives, and others. It is used to send data from one system to another. Portable two-way communications systems, computing devices, and accompanying networking equipment make up mobile technology. Mobile technology is largely employed in cellular communication systems, information transfer systems and other related areas. Mobile technology use is fast expanding; its applications are getting increasingly broad over time, and it is progressively replacing other similar sources of communication on the market, such as post offices and landlines. Mobile technologies have progressed from a simple phone and texting device to a multi-tasking system that can be used for global positioning system (GPS) navigation, internet browsing, gaming, mobile learning, and instant messaging, among other things. With the rise, experts claim that the future of computer technology is dependent on wireless networking and mobile computing. The penetration rate of mobile technologies is increasing rapidly day-by-day which results into more connectivity, easy communication and provides varied opportunities at business and educational levels. The numbers of wireless internet users are expected to grow to more than 60 per cent by 2025 (NCC, 2022) with more users accessing the internet through their mobile phones. Across the different users of mobile phones, the undergraduate students are not the least in the race. Various studies have been done on the technology association with a younger demographic particularly being students (Panchal, 2022). Cynergy Tech (2023) averred that mobile technology is a broad term encompassing all our daily electronic devices. It includes smartphones, tablets, wearables (e.g., smart watches), smart home devices, and more. They asked the question of the nature of life in the present without cell phone apps and determined that it is difficult to imagine living without the little pieces of software that allow us to do things like research information online or get directions while traveling in different parts of the world. They also concluded that mobile technologies have enhanced our lives by increasing our access to information 24/7 wherever we go. In fact, mobile technology usage spans every age group and economic strata; millennial is even more likely than older generations to rely on their phones for everything from work emails to socializing with friends.

Khambekar (2023) described a mobile device, or handheld, as an electronic device that enables some kind of computing, and which is small enough to be easily carried around. These devices are quite pervasive nowadays. Some commonly used mobile devices include cell phones, Personal Digital Assistants (PDAs), and multimedia players. Their uses are not only varied, but also

growing day by day. Goyal (2021) observed that, through tablets and small PCs, mobile technology is becoming increasingly popular. This smartphone system has since been improved to a big multitasking computer that can be used for GPS navigation, gaming, internet browsing, and instant messaging. Tablets and portable laptops have increased the adoption of mobile technology. The mobile networks that connect these devices are referred to as wireless systems. They allow speech, data, and (mobile) apps to be shared between mobile devices. Any gadget with internet capabilities that can be accessed from anywhere is referred to as mobile technology. Smartphones, tablets, some iPods, and laptops already fall within this category, but this list will undoubtedly grow in the future years.

Influenced by the COVID-19 epidemic, people in many countries were quarantined, which brought about unexpected inconveniences in many aspects of their life. Schools were closed and many countries looked towards online teaching and learning to continue education. In 2020, many schools around the globe including schools in Nigeria, required teachers and students at all educational levels to use long-distance educational technologies to ensure the teaching and learning during the suspension of classes. Among plenty of educational technologies, mobile learning based on mobile devices has been widely utilized by students during this period due to its great advantages of not being limited by time and place (Naciri *et al*., 2020). Furthermore, compared with teachers operating computers in formal classroom teaching, this period of online education required students to learn how to operate the technologies by themselves in their homes. Students might change their behavioural intentions to use mobile technologies in online education. Therefore, it is necessary to investigate students' perceptions of using mobile technologies in informal learning during the COVID-19 epidemic. According to Guo et al. (2020), during the COVID-19 quarantine period, mobile technologies have been greatly promoted to be used by students to assist their learning.

Types of Mobile Technologies

Mobile technology constitutes technologies that facilitates communication, through a portable device. Through the review of literature relating to mobile technologies, it was observed that mobile technologies are in three primary areas which are Connectivity, Devices and Applications (Goyal, 2021). Mobile technologies have revolutionized the way students learn in universities. Some of the mobile technologies relevant to education and used in university learning include the following:

Mobile Connectivity

In the area of connectivity, some relevant mobile technologies include:

1. 4G
2. 3G
3. GSM
4. CDMA
5. Wi-Fi

1. **3G, 4G and 5G (Third, Fourth and Fifth -Generation Access Technology)**: The third letter in the designation 3G stands for third-generation access technology, which allows mobile phones to connect to the internet. Every new technology introduces new frequency bands and data transmission rates.

   The first generation emerged in the 1980s. First-generation uses large phones that had to be mounted on top of cars because they were too heavy to hold. Text messaging was made possible by the second-generation network, which became available in the 1990s. This huge and game-changing advancement also provided a more secure network and laid the path for today's ubiquitous 3G and 4G technology.

   The development of 3G connection-based networks in 2001 marked the start of mainstream Internet use on mobile phones. Soon after, smartphones were introduced, bringing all of the capabilities of a device into the palm of your hand. The signals are transmitted by a network of telephone towers, ensuring robust and relatively rapid long-distance communication. The user's mobile phone is receiving data from the tower nearest to it. Although it may not appear complicated, 3G technology was revolutionary at the time it was introduced. Upload speeds of up to 3 Mbps are possible on 3G networks. For example, about 15 seconds for uploading a

3-minute MP3 song. The fastest 2G phones, on the other hand, may get up to 144Kbps for example, about 8 minutes to download a 3-minute song. 3G systems are intended for digital phones with a full-screen display and better connectivity.

The fourth generation of mobile networking technology is known as 4G, which comes after the 2G and 3G networks. Although it is commonly referred to as 4G LTE, this is not exactly right because LTE is just one sort of 4G. Most mobile network service providers use it now since it is the most developed technology. However, 5G is becoming operational alongside current 3G and 4G mobile networks. When it initially came out, 4G revolutionized how we use the mobile internet. Despite the fact that 3G networks were relatively limited, 4G network connectivity allowed consumers to browse the internet and watch HD films on their mobile devices, thereby turning smartphones into laptops.

Most tasks that you could do on a laptop or desktop computer could now be done on mobile devices like smartphones or tablets. No matter how much data you require, 4G networks allow you to keep consistent speeds practically anywhere. 4G was launched in the Nigeria in 2016. Currently, the number of mobile subscribers using 3G outnumbers those using 4G. Expect this to alter in the coming years as 4G contracts become more affordable and 4G network coverage increases across Nigeria. Premium 4G offers download speeds of around 14 Mbps, which is over five times quicker than the 3G network's predecessor. 4G networks can currently attain speeds of up to 150 Mbps, allowing users to download gigabytes of data in minutes, if not seconds, rather than hours as with 3G networks. Uploading data is also significantly faster with 4G – normal upload speeds are over 8 Mbps, with theoretical rates of up to 50 Mbps, whereas 3G upload speeds are under 0.5 Mbps. (Goyal, 2021; Fendelman, 2021). 5G which is the fifth generation of mobile networking technology is a wireless technology with a limited rollout that's intended to improve on 4G. 5G promises significantly faster data rates, higher connection density, much lower latency and energy savings, among other improvements. The anticipated theoretical speed of 5G connections is up to 20 Gbps per second. (Fendelman, 2021). 5G offers the ability to connect a massive number of devices simultaneously, enabling transformative applications and services like autonomous vehicles, Internet of Things (IoT), augmented reality (AR) and more. It is the fifth generation of cellular network technology, succeeding 4G LTE. 5G offers several improvements over 4G, as well as some new features such as network slicing and massive machine-type communications (mMTC). Network slicing allows operators to create separate virtual networks within the same physical network, which could be used for different purposes, such as providing high-speed mobile broadband or supporting industrial applications. mMTC allows for the connection of millions of low-power devices, such as sensors and actuators, which can be used to monitor and control the environment or track assets. (Rajesh, 2022). Though 5G is the bleeding edge of access technology, 4G and 3G are the most commonly used in Nigeria and in the educational sector. Students could take advantage of the connectivity power of 3G and 4G to engage in online classes, stream class tapes and lecture recordings, and enable some of the application that facilitate learning using mobile technologies.

2. **Global System for Mobile technology (GSM) and Code Division Multiple Access: (CDMA)**: The (GSM) is an acronym for Global System for Mobile Communication. GSM is a cellular technology that is open and digital and is used for mobile communication. It operates on the 850 MHz, 900 MHz, 1800 MHz, and 1900 MHz frequency ranges. It employs a hybrid of FDMA and TDMA. Code Division Multiple Access (CDMA) is an acronym for code division multiple access. It is a channel access mechanism that also serves as an example of multiple access. Multiple access simply means that data from multiple transmitters can be delivered onto a single communication channel at the same time. (Goyal, 2021). Cell phones experienced a significant advancement when they transitioned from 1G to 2G. The primary distinction between these two mobile telephone systems lies in the nature of their radio signals, with 1G utilizing analog signals and 2G employing digital signals. The primary objective of this transition was to establish secure and reliable communication channels, which necessitated the adoption of CDMA and GSM concepts. Notably, 2G

networks introduced crucial features, including SMS and MMS services, elevating data communication capabilities alongside voice communication. To achieve the capabilities of 2G, multiplexing was utilized, allowing multiple users on a single channel. This enabled the integration of voice and data services on cellular phones. Noteworthy advancements from 1G to 2G encompassed essential services such as SMS, internal roaming, conference calls, call hold, and billing based on services like charges for long-distance calls and real-time billing. In terms of data transfer speeds, 2G offered maximum speeds of 50 Kbps with General Packet Radio Service (GPRS) and up to 1 Mbps with Enhanced Data Rates for GSM Evolution (EDGE) (Rajesh, 2022; Fendelman, 2021).

3. **Wi-Fi (Wireless Fidelity)**: Wi-Fi is a wireless networking technology that allows us to connect to a network or to other computers or mobile devices across a wireless channel. Data is delivered in a circular region over radio frequencies in Wi-Fi. Wi-Fi (Wireless Fidelity) is a generic acronym for a communication standard for a wireless network that functions as a Local Area Network without the use of cables or other types of cabling. (Goyal, 2021). Due to the method network operators employ in delivering Wi-Fi, it usually allows for large data transfer at a relatively cheaper pricing. This gives students all the advantages of accessible technologies with less metering restrictions which could directly impact costs. For instance, the University of Port Harcourt (Uniport) ICT department, has Wi-Fi access for registered students, provided they are within proximity to the ICT building and environs.

   The population share with mobile internet access in Nigeria was forecast to continuously increase between 2024 and 2028 by a total of 9.8 percentage points. After the ninth consecutive increasing year, the mobile internet penetration is estimated to reach 49.74 percent and therefore a new peak in 2028. Notably, the population share with mobile internet access has continuously increasing over the past years. The penetration rate refers to the share of the total population having access to the internet via a mobile broadband connection. The following table are an excerpt of Key Market Indicators (KMI), which are a collection of primary and secondary indicators on the macro-economic, demographic and technological environment in up to 150 countries and regions worldwide. All indicators are sourced from international and national statistical offices, trade associations and the trade press and they are processed to generate comparable data sets. (Sasu, 2023).

Mobile Devices

Mobile Devices according to Ibeneme (2020), were used to project a whole lot of consumer electronics. They were used to describe portable devices that are internet friendly and often fit on our lap, in the palm or our pocket. They are also viewed to have the competency to help students do many of the things they do with desktop computer while they are on the move. A mobile device is a handheld computer, usually small enough to be carried in one hand. A mobile device has a battery to store electricity, a user interface, and the ability to send and receive information. The key characteristic of a mobile device is its portability. It needs to be functional without being plugged into electricity or network outlets. It typically, has a screen or other user interface, and a battery to store power. There are many types of mobile devices, including smartphones, smartwatches, tablets, laptop computers, handheld gaming consoles, and e-readers. Saigo, Perkins and Chapel (2022). Small devices that are designed to store but not send and receive information like external hard drives, are not considered mobile devices

According to Galal (2023), As of January 2022, Nigeria had more than 122 million internet users - the highest number reported all over Africa. Meanwhile, Egypt ranked second with over 80 million users. The majority of web traffic in leading digital markets in Africa originated from mobile devices - in Nigeria, one of the countries with the largest number of internet users worldwide, 82 percent of web traffic was generated via smartphones and roughly 16 percent via PC devices. This is due in part to the fact that mobile connections are much cheaper and do not require the infrastructure that is needed for traditional desktop PCs with fixed-line internet connections. Some relevant mobile devices with applications in the education sector include:

1. Smartphones

2. with respect to higher enjoyment levels, greater "engagement, motivation, focus and enthusiasm" (Martin & Ertzberger Laptop computers
3. Netbooks
4. Tablets
5. Ultra- Mobile PCs
6. Personal Digital Assistant (PDA)
7. E-readers
8. Handheld Gaming Devices

1. Smartphones: A smartphone is a type of mobile phone that has much more processing power and greater hardware capabilities than a basic feature phone. A basic feature phone is designed primarily to place voice calls and do texting, but a smartphone is essentially a high-powered computer in the palm of your hand, allowing for desktop-like web browsing, high-definition playback of videos, and the downloading and usage of apps that can do just about anything you can think of. Smartphones also act as high-powered cameras, recording devices, music players, and personal assistants, among many other things. Remember, they are computers (though small), and as such, you are required to be able to troubleshoot and repair them. Prowse (2019) Mobile phones are enabling the "here and now" of mobile learning, i.e. the ability to practice authentic learning instantly irrespective of time or location. This type of ubiquitous learning has been shown to produce significant improvements in student performance, specifically, 2013)

Smartphones, are an upgrade of the commonly used cell phones. With their sensitive- touch, small-screen size and absence of hardware keyboards, they might be quite challenging to work with for a longer period of time. For instance: Apple iPhone, Samsung Galaxy, Sony Ericsson, Blackberry,

Plate 2.1: Samples of smartphones

2. Laptop Computers: The laptop has an all-in-one design with in-built touchpad, keyboard, monitor and speakers. Laptops also offer the alternative of connecting to a larger monitor, regular mouse and other peripherals. It carries out the functions of a desktop and much more. A laptop is a type of computer that unlike the orthodox desktop computers, it is portable, has battery for on-the-go usage. It has a screen, processors, web cam and speakers in a notebook type form factor and can generally vary in size (with screen sizes ranging from 8" to above 17" diagonal). It has high processing power and great hardware capabilities and, in many cases, packs more processing power than the traditional desktop computers. Laptops allow for easy connectivity to the internet with the availability of Wi-Fi and to other devices through Universal Serial Bus (USB) drives, thunderbolt drives, USB-C drives, and HDMI slots (Prowse, 2019)

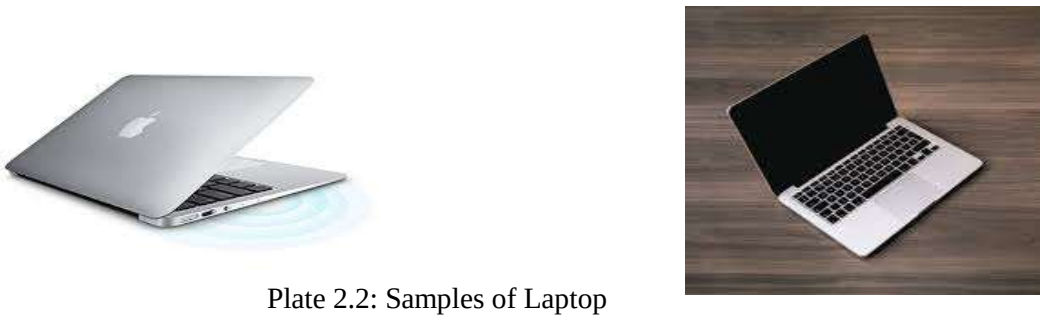

Plate 2.2: Samples of Laptop

3. Netbooks: Netbooks have a more compact form, with 10-inch screen sizes or smaller. Netbooks usually have long battery lives and do the most common tasks that we use our computers for, like surfing the web, checking email and using office productivity programmes.
4. Tablets: Early tablet PCs used pen-based computing and ran a tablet-customized version of Windows XP. After Apple's innovation of iPad, tablets are re-directed from running the same operating systems as desktop and laptop PCs, to iOS and Android. The uniqueness of tablet computers is that they don't have keyboards or touchpads though might offer an optional removable keyboard. For instance: Apple iPad, Samsung Galaxy Tab. A tablet computer, or simply "tablet," is a thin, mobile device that is operated with a touchscreen and generally measures between 6 and 11 inches diagonally. It can be used for simple tasks such as reading books and browsing the Internet but can also be used for more complex tasks such as word and spreadsheet processing, audio and video recording/editing, multimedia live streaming, photo editing, collaboration, and even programming. The more complex the task, the more powerful the tablet that is required. The whole concept of this hardware configuration is based on portability and ease of use. Therefore, tablet computers are generally less powerful than desktop computers and laptops, but the hardware is matched to the type of applications the device will be used for. The two main goals for tablets are to be highly portable and have powerful processing capabilities. Tablets tend to have similar functionalities as smartphones with the advantage of having bigger screens. Many of the application that facilitate mobile learning on smartphone, have tablet compatible versions (Prowse, 2019).

Plate 2.3: Samples of Tablet

1. Ultra-Mobile PCs: UMPCs are mini computers or mini tablets with touch-screen, stylus and keyboard input options. UMPCs are truly pocketable devices and offer traditional or full-fledged operating systems like Windows and Linux.
2. Personal Digital Assistant (PDA): PDAs are handheld devices that combine elements of computing, telephone/fax, Internet and networking. Unlike portable computers, most PDAs began as pen-based, using a stylus instead of keyboard for input and incorporated handwriting recognition features. Some PDAs could also use voice recognition technologies.
3. E-readers: E-book, also called e-readers, are similar to tablet computers, except they are mainly designed for reading digital downloadable books known as e-books. Most e-readers use LCD Display and an e-ink, that makes reading easier than with a traditional computer display. Examples: The Amazon Kindle, Barnes and Noble Noo and Kobo. E-readers use electronic paper technology (which is generally black and white) making longer-term reading easier on the eyes when compared to reading on a tablet or a smartphone. However, e-readers are not great when it comes to surfing the Web, though some do have Internet access. For some people, the e-reader is the only way to go because of how easy it is on the eyes and because it displays text well both in dark environments and in sunlight. Plus, battery life is far superior to tablets and smartphones. Most manufacturers of these devices also allow users to read their digital libraries by installing a reader app to their tablets or smartphones (or PCs) and synchronizing between the devices. E-readers are often charged via Micro-USB and many can connect via Wi-Fi or with a cellular connection to facilitate the downloading of book files. E-readers give students the advantage of having all their lecture notes and materials in a portable device that can allow for studying from any location at any time without the burden of carrying several hardcover books which could be bulky (Prowse, 2019).

Handheld Gaming Devices: Handheld gaming devices are portable, lightweight video game consoles that have built-in game controls, screen and speakers. With a handheld gaming console, students' favourite console games could be played wherever they are, whether on the move or while watching the Television.

Fundamentally, mobile technology with internet access enables students to acquire desired knowledge at every point in time. By carrying the device everywhere, they regard them as friendly and personal (Traxler, 2007). They are portable but rather than focus on an item's portability, the "mobile device" term describes its helpfulness to users: They are small and capable enough not to hinder our mobility. It also connotes wireless connectivity. If a device does not have internet services, it would not probably be considered as being excellently capable of enabling productivity. The connectivity question could now be the thin line between "portable" and "mobile" devices. An external hard drive or external power bank, for instance, might be considered a portable device while a small wireless hotspot could be considered a mobile device. Mobile devices with the necessary applications could be predominantly utilized for word meaning and phonetics in English language as their portability enables quick access to the meaning of difficult words and pronunciations. There are other numerous apps that instructors could use while solving grammar related issues based on the realization of the connection between today's undergraduates and how mobile device technologies have become central to their existence.

It is quite convenient to consider the integration of the mobile device to education due to benefits such as easiness in accessing content, integration of a broad range of educational activities, support of independent study and students' organization, encouragement of students' enthusiasm, support of classroom-based collaboration and interaction as well as support of inquiry-based instruction and learning, to teaching and learning. Significant projects of this digital age have revealed that mobile device has the power to transform and empower our undergraduates. In the regular classroom sessions, there are language teachers who allow students to use mobile devices to explore electronic dictionaries or to access information for the completion of a given activity. They also encourage the use of available learning software programs with visual features which are sometimes free online. Mobile device with internet connectivity could search thousands of information, provide details of a high degree of accuracy to the reader and as such are made a part of the lives of the users and not just a mere ornament (Dos, 2014).

Whether the students use their mobile device for the purpose of learning English or not has become an issue of great concern. Haruna et al. (2016) attributes the rate of the failure in English language exams to the extent the students cling to their mobile devices for trendy social activities which distract them from focusing on their academics. Andrew, Jacob and Ary (2015) in their study on 'The Relationship Between Cell Phone Use and Academic Performance' concluded that while controlling for other established predators, realized that as the students increase their use of mobile phone, their academic performance decreased.

There are numerous exhibitions of character of students that are perceived to be the result of the negative effect of the misuse of the mobile device (Kuznekoff & Titsworth, 2013). It is viewed to have a tendency to neutralize the power against indiscipline and how much it could disrupt school academic activities (Haruna et al, 2016). The researcher is therefore set out to view the different perceptions of the undergraduates of University of Port Harcourt in relation to the use of their mobile device for academic purposes and its possible incorporation into the school system.

Use of Mobile Technology for Education Purposes

Mobile learning is associated with the educational use of mobile technology with the purpose to support, aid and enhance the educational process, anytime and anywhere; at the same time, the mobility of technology, learners and learning are considered (Kukulska-Hulme & Traxler, 2019). Undergraduates utilize their mobile devices (mobile phones, tablets, etc.) for educational purposes and mobile technology has the potential to contribute towards a productive educational environment in tertiary education. For instance, evidence from a large-scale study indicated that, appropriate use of smartphones could lead to better academic outcomes for higher education students. Researchers Miller and Cuevas (2017); Lin et al. (2021); Salhab and Daher (2023) reported on the advantages and pedagogical affordances of mobile learning; indicative educational advantages/benefits include

flexibility in learning in terms of space and time, portability, students' motivation and engagement, collaboration and communication among students, personalization and sense of ownership. In parallel, potential barriers include technological barriers like limited internet connectivity, hardware/software related barriers, instructional barriers (e.g., inappropriate material available for mobile devices or difficulties in locating learning content) and inequality concerns for socially disadvantaged students (Nikolopoulou, 2022). It was noted that mobile learning-technology barriers are similar to Information Technology (ICT) barriers; i.e., external (also called first-order) barriers and internal (also called second-order) barriers (Nikolopoulou et al., 2023). External barriers refer to obstacles that are extrinsic to students and include limited resources (e.g., access to equipment, digital educational resources), lack of support (e.g., availability of technical support) and lack of institutional strategies (e.g., university vision and plans). Internal barriers refer to obstacles that are intrinsic to students, which include knowledge, skills (e.g., competence to use the technology), personal beliefs and attitudes (e.g., negative views), as well as confidence/self-efficacy.

Benefits of Mobile Technology for Teaching and Learning

The mobile technology devices that have proven very useful in the educational set up include cell phones, Netbooks, iPods, e-readers and even PDAs. According to Park et al. (2012), students are generally positive in utilizing mobile devices for learning in the current era. These devices have been found to provide the students with the ability to control their individual learning and switch the learning environment from formal to informal while retaining information on a higher rate. The devices keep the students alert, focused, keen, engaged and motivated all through the lesson. There is enough evidence to suggest that teachers have benefited from the mobile technology in the sense that they are able to notice the individual student needs and allow the students to share information among themselves (Ally, 2014). The mobile devices are easy to use because of the larger screens, variety of apps, video recording capabilities and a higher processing. Research showed that due to these capabilities, students spend more time and effort in learning tasks of interest to them. During activities and discussions facilitated by the mobile devices, students find learning to be more fun as compared to a typical lecture-based teaching session.

When tablets and iPads are used in classrooms, they have had a significant effect on learning. According to Kenny et al. (2012) the apps available enable the students to work independently and also in groups, developing on their own the necessary skills that they otherwise have not acquired in a normal classroom set up. Mobile devises also help foster a strong connection between the student and the teacher through the interactions where both parties want to share information with each other. The ease with which the teachers, students and even parents could communicate with each other on the mobile devices has created a routine around active communication which fosters good relationships between the parties. In addition, with the multitude of apps available, the teachers could simply update the students' data even when outside the classroom. Mobile devices have also been of the main learning enhancement for the students with special needs such as autism, dyslexia, visual impairment, motor skills impairment and attention deficit hyperactivity disorder due to the special feature fitted within them like the accelerometer, touch screen, on-screen typing, cameras, video and audio recorders and talkbacks. Also, the mobile devices have enables learning anywhere and anytime, allowing a shift from the traditional way of learning in an enclosed place driven by an instructor with limited knowledge. The teacher professionalism also improves because before mobile technology, the teachers used to teach traditionally. Now they prepare their teaching material with multimedia, constructing them to become their new personalized teaching material and apply that in class. By doing this, they improve their professionalism in teaching.

Theoretical Framework

Constructivism Theory

This theory was propounded by Jean Piaget in 1975. Piaget emphases on the interaction of experiences and ideas to create new knowledge. Constructivism theory is that which encourages that knowledge is best gotten through a process of action, reflection and construction. Constructivists focus on how learners construct their own knowledge based on their prior knowledge. This theory can be called theory of knowledge as the theory also focus on the fact that learners can actually construct their own meaning by solving a task. The theory believes that learners construct their own

understanding, meaning and knowledge by experiencing different things and reflecting on these experiences. To achieve these learners must explore, assess what they know and ask questions. Learners can use problem solving skills and experiments to create more knowledge and reflect on what they are doing. Constructivist approaches in education emphasizes collaboration, learner- centres experiences and active engagement. In constructivism theory, it is believed that learners do not acquire knowledge by passively consuming information.

METHODOLOGY

The research design for this study was descriptive survey design. According to Nworgu (2015), descriptive survey is concerned with systemic description of events as they were, because it was aimed at collecting data on something and describing the characteristics and facts about the population of a given study. From the above definition, descriptive survey is the study in which a researcher collects data from a given population and described certain characteristics or attributes of them as they were. The research study area was the Faculty of Education in the University of Port Harcourt. The University of Port Harcourt is a federal government owned university in Nigeria. The university was established in 1975 as a University College, Port Harcourt in Rivers State. It was given the university status in 1977. The school is located in Choba, Alakahia, Rumuekini and Aluu communities of Obio/Akpor and Ikwerre Local Government Areas of Rivers State which is in the Niger Delta region of Nigeria. There are twelve (12) Faculties and eighty-eight (88) Departments in the University of Port Harcourt namely, Faculty of Education, Faculty of Humanities, Faculty of Social Science, Faculty of Science, Faculty of Engineering, Faculty of Management Sciences, Faculty of Agriculture, Faculty of Pharmaceutical Sciences, Faulty of Law, School of Science Laboratory Technology (SSLT) and College of Health Sciences. The Faculty of Education was created on 1st October 1982, as a school organization and was later restructured to a faculty organization with one department due to a university-wide restructuring at the time. Today, in the Faculty of Education, there are eight departments in Faculty of Education which are Adult and Non-Formal Education (DAE), Curriculum Studies and Educational Technology (EDC), Early Childhood and Primary Education (ECPE), Educational Foundations (EDF), Educational Management and Planning (EDM), Educational Psychology, Guidance and Counselling (EDP), Human Kinetics & Health Education (KHE) and Library and Information Science (LIS). Curriculum Studies and Education Technology is known as EDC department in the University of Port Harcourt, there were various options (courses of study) offered in the EDC department which were Physics, Chemistry, Biology, Mathematics and Computer Science. The data in this study were collected from eight departments in the Faculty of Education, which are EDM, DAE, EDC, KHE, EDF, EDP, LIS and ECP

The population of the study consists of all 300 level students in the Faculty of Education (EDM, DAE, EDC, KHE, EDF, EDP, LIS and ECPE) departments of the Faculty of Education, in the current 2023/2024 session. The population according to Dean, Faculty of Education is one thousand, four hundred and sixty (1,468) (male = 506 and female = 962). Each of the eight departments have different options under them, all of which were added to arrive at the total number of the 300 level students in the departments The sample size for this study was three hundred and twenty (320) respondents. Multi stage sampling technique was used in this study. Simple random sampling technique was used to select eight departments from the Faculty of Education. Simple random sampling technique was also used to select forty (40) respondents from the each of the Departments chosen. This means that equal number of respondents were drawn from the department to make up the needed sample size of 320 for the study

In this study, the instrument for data collection was self-structured questionnaire titled "The Role of Mobile Technologies in Supporting Inclusive and Accessible Learning among Undergraduates in University of Port Harcourt" (RMTSIALUUPH). The instrument was divided in two parts, part A and B. Part A contained respondents' demography while part B contained assessment of the use of mobile technology for learning among undergraduates. The items of the instrument were structured based on the research questions and contained five (5) items each of the research questions to make up to twenty-five (25) items in this study. The instrument was responding to four Likert scale of Strongly Agree (SA=4 points), Agree (A = 3 points), Disagree (D = 2 points) and Strongly Disagree (SD – 1 point). Face and content validity were employed in this study. The instrument was validated by

researcher's supervisors and two other evaluation experts in test construction. Any correction or suggestion made were corrected and included to make the instrument measure what it actually intended to measure. Reliability of the Instrument The reliability of instrument was determined by using Cronbach alpha method. This technique helped to establish the internal consistency of the items. In other to achieve this, the instrument were administered to the respondents once and the even and odd numbers were grouped and analyzed to establish the coefficient of reliability index of 0.79 for the study. The instrument were distributed to the respondents to obtain the required information from them in order to ensure efficiency, objectivity and maximum return, copies of the questionnaire were given to students at the University of Port Harcourt, selected randomly from the population of the study. Out of the three hundred and twenty (320) instruments administered to the respondents, three hundred and fourteen (314) were retrieved for data analysis. The data obtained were analyzed using mean, standard deviation and t-test. Mean and standard deviation were used to answer the research questions while t-test was used to test the hypotheses at 0.05 alpha level. This was made easy by use of SPSS version 23.0.

RESULTS AND DISCUSSION

Research Question One: *What is the level of mobile technology use among undergraduates in the Faculty of Education?*

Table 4.1: Mean and Standard deviation analysis on the level of mobile technology use among undergraduates in the Faculty of Education

S/N	Level of Mobile Technology Use among Undergraduate	SA	A	D	SD	Mean	Standard Deviation	Remark
1	You often use your mobile phone daily in learning	-	158	128	28	2.41	0.65	Disagree
2	You use mobile phone as a student	19	183	102	10	2.67	0.64	Agree
3	Mobile technology is an important tool in today's society	206	89	12	7	3.57	0.68	Agree
4	The use of mobile technology impacts your daily life negatively	-	88	8	218	1.59	0.90	Disagree
5	The use of mobile technology impacts your daily life positively	4	195	106	9	2.62	0.57	Agree
	Average mean					2.57	0.69	Agree

- ≥3.00 = Strongly Agree (SA), 2.99-2.50 = Agree (A), 2.49 – 2.00 = Disagree (D) and <1.99 = Strongly Disagree (SD)

Table 4.1 shows that the respondents agreed to items 2,3 and 5 which implies that they use mobile phone as students, mobile technology is an important tool in today's society and that the use of mobile technology impacts your daily life positively with mean scores of 2.67, 3.57 and 2.62 respectively which are all above the criterion mean of 2.50 while the respondents disagreed with items 1 and 4 which states that they often use mobile phone daily in learning and that the use of mobile technology impacts their daily lives negatively with mean scores below the criterion mean of 2.50. The grand mean scores of 2.57 which is greater than the criterion mean of 2.50 which indicates that level of mobile technology uses among undergraduates in the Faculty of Education is high.

Research Question Two: *What are the educational use of mobile technology among undergraduates in the Faculty of Education?*

Table 4.2: Mean and Standard deviation analysis on the educational use of mobile technology among undergraduates in the Faculty of Education

S/N	Level of Mobile Technology Use for Educational Purposes	SA	A	D	SD	Mean	Standard Deviation	Remark
1	Your mobile phone is used for education purposes	190	85	24	15	3.43	0.83	Agree
2	You use your mobile phone for studying or completing academic assignments	187	97	18	12	3.46	0.77	Agree
3	Mobile technology enhances your academic performance	12	168	119	15	2.56	0.65	Agree
4	You use mobile technology for conducting research or accessing academic journals	79	151	77	7	2.96	0.77	Agree
5	You participate in online discussion or group project using our mobile phone	202	92	16	4	3.57	0.65	Agree
	Average mean					**3.20**	**0.73**	**Agree**

- ≥3.00 = Strongly Agree (SA), 2.99-2.50 = Agree (A), 2.49 – 2.00 = Disagree (D)and, <1.99 = Strongly Disagree (SD)

Table 4.2 revealed that the respondents agreed to items 1, 2, 3, 4 and 5 that their mobile phones are used for education purposes, they use their mobile phones for studying or completing academic assignments, that Mobile technology enhances their academic performance, they use mobile technology for conducting research or accessing academic journals and that they participate in online discussion or group project using our mobile phone with mean scores of 3.43, 3.46, 2.56, 2.96 and 3.57 respectively which are all above the criterion mean of 2.50. The grand mean scores of 3.20 is greater than the criterion mean 0f 2.50 which implies that educational uses of mobile technology among undergraduates in the Faculty of Education is very high.

Test of Hypotheses

Hypothesis 1: There is no significant difference in the level of mobile technology use among undergraduates in the Faculty of Education

Table 4.6: t-test analysis on difference in the level of mobile technology use among undergraduates in the Faculty of Education based on gender

Variables	N	Mean	Std. Deviation	Df	t-cal	t-crit	Level of Sig.	Decision
level of mobile technology uses Female	195	2.58	0.35	312	-0.653	1.960	0.05	Not Significant
Male	119	2.56	0.35					

Result in Table 4.6 shows that the mean score of female and male students are 2.58 and 2.56. The standard deviations of their scores are 0.35 respectively. However, when these mean differences were subjected to an independent t-test statistic, it was observed that the calculated t-value -0.653 is less than t-critical 1.96 at 0.05 level of significance, so null hypothesis is accepted. Hence, there is no significant difference in the level of mobile technology uses among undergraduates in the Faculty of Education based on gender.

Hypothesis 2: There is no significant difference in the educational uses of mobile technology among undergraduates in the Faculty of Education

Table 4.7: t-test analysis on difference in the educational use of mobile technology among undergraduates in the Faculty of Education based on gender

Variables		N	Mean	Std. Deviation	Df	t-cal	t-crit	Level of Sig.	Decision
Educational uses of mobile technology	Female	195	3.23	0.35	312	-2.585	1.960	0.05	Significant
	Male	119	3.14	0.34					

Result in Table 4.7 shows that the mean score of female and male students are 3.23 and 3.14. The standard deviations of their scores are 0.35 and 0.34 respectively. However, when these mean differences were subjected to an independent t-test statistic, it was observed that the calculated t-value -2.585 is greater than t-critical 1.96 at 0.05 level of significance, so null hypothesis is rejected. Hence, there is a significant difference in the educational uses of mobile technology among undergraduates in the Faculty of Education based on gender.

DISCUSSION OF FINDINGS

Level of Mobile Technology uses among Undergraduates

The result of this study showed that the level of mobile technology use among undergraduates in the Faculty of Education is high and there is no significant difference in the level of mobile technology uses among undergraduates in the Faculty of Education based on gender therefore, the null hypothesis was accepted in favour of the alternative. The finding of the present study agrees with an earlier study by Amadi and Agbarakwe (2019) which reported that students' level of awareness for the use of the mobile device for learning was high and positive while showing that their level of awareness was not dependent on gender.

Educational uses of Mobile Technology

The result of this study showed that the educational uses of mobile technology among undergraduates in the Faculty of Education is very high but there is a significant difference in the educational uses of mobile technology among undergraduates in the Faculty of Education based on gender, this implies that a particular sex used mobile technology more for educational purposes therefore, the null hypothesis was rejected in favour of the alternative. The finding of the present study is in agreement with that of Nwachukwu and Onyenankeya (2017) which revealed that 38.2 percent of students spent between 1 and 5 hours per day on their phones. Majority of the respondents (98%) used their phones to communicate with family and friends. About seventy-five percent used their smartphones for social networking. Only twenty-four percent of students engaged their smartphones for academic activities. Age and number of hours spent on phones were found to be significant (p=0.001). It was also found that the activities students engaged their phones with determined the number of hours they spent on the phones.

CONCLUSION

The role of mobile technologies in fostering inclusive and accessible learning among undergraduates at the University of Port Harcourt is both transformative and indispensable. As higher education evolves to meet the demands of diverse learners, mobile technologies provide a responsive and adaptive platform that addresses numerous barriers traditionally associated with access, engagement, and educational equity. In this study, mobile technologies were found to be instrumental in supporting students with varied learning needs, disabilities, and socio-economic backgrounds. Through their capacity to deliver learning resources on a flexible, portable, and personalized basis, mobile devices such as smartphones, tablets, and laptops empower students to overcome logistical constraints, enabling learning to occur anytime and anywhere. Moreover, mobile technologies facilitate a more interactive and collaborative educational experience, bridging the gap between students and educators.

The inclusion of accessible features, such as voice-to-text functions, screen readers, and captioning tools, has notably enhanced the learning experiences of students with disabilities, while diverse applications allow students to customize their learning processes according to personal needs. However, despite these advantages, this study also identified challenges, including varying degrees of digital literacy, inadequate internet access, and occasional lack of institutional support in integrating these technologies into core pedagogical practices. Addressing these challenges is essential to maximizing the benefits of mobile technologies in fostering an inclusive learning environment. mobile technologies hold tremendous potential for promoting inclusive and accessible learning at the University of Port Harcourt, providing a powerful solution to broaden educational access, enhance engagement, and foster equality among undergraduates. Their effectiveness, however, will largely depend on the university's commitment to addressing existing barriers, enhancing digital infrastructure, and supporting faculty and students in adopting these tools meaningfully.

RECOMMENDATIONS

The findings of study recommended as follows:

1. The University of Port Harcourt should invest in robust and reliable digital infrastructure, including high-speed internet, campus-wide Wi-Fi, and secure access points, to ensure seamless connectivity for all students using mobile technologies.
2. To bridge the digital skills gap, the university should develop and mandate digital literacy programs for students and faculty. These programs should cover fundamental skills in using mobile learning applications, navigating online resources, and employing accessibility features.
3. University management should provide professional development for faculty, equipping them with the skills to integrate mobile technologies into their teaching effectively. Training should focus on instructional design, inclusive teaching strategies, and best practices in mobile-supported learning.
4. The university should ensure that all learning platforms and digital resources are fully accessible. This includes enabling screen readers, audio descriptions, captioning, and other accessible technologies to accommodate diverse learning needs.
5. A dedicated support center should be established to provide technical assistance, training, and troubleshooting for students and faculty using mobile technologies. This center can also serve as a hub for exploring new educational applications and assessing their accessibility.
6. The university should prioritize creating and curating inclusive digital content that reflects diverse perspectives and learning styles. Learning materials should be provided in various formats, such as audio, video, and text, to accommodate different learner preferences.
7. University policymakers should establish and enforce frameworks that prioritize inclusivity in all digital learning initiatives. Policies should mandate the use of accessible resources and outline requirements for faculty to integrate mobile technologies into their courses.

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