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Use of AI and Information Technology to Help Students with Disabilities and Special Needs: An Overview

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Abstract
A large number of students in Nigeria cannot fully benefit from a conventional education program because they are handicapped or have disabilities that hinder their ability to participate in a typical classroom environment. Artificial Intelligence (AI) Knowledge can be utilized to advance teaching as well as learning methods in this age of rapid technological innovation. Assimilating technology in knowledge or learning, particularly in advanced education will be able to allow both teachers and pupils to increase the excellence of schooling as well as the intended learning goals. The purpose of this paper is to investigate the current Artificial Intelligence (AI) and technologies used in most of the tertiary establishments in Nigeria and their impact on the learning of students through the following aspects: the adoption of educational technologies in teaching and learning processes by tertiary institutions affects students with the impact of educational technologies. The teaching of academic staff also faces trials in the acceptance of teaching and passing knowledge through educational technologies. Artificial Intelligence (AI) and Computer-based technologies (CBT) can particularly play a significant role for these students. Computer technology cannot only enable a wider collection of educational accomplishments to meet a range of needs for students with mild learning disorders, but there are now various technologies which can enable even children that have disabilities to become active learners in the classroom with their classmates without disabilities. This indicates that educational institutions can leverage technology to create a positive impact on learning for children with disabilities as highlighted in the study.

Keywords: Artificial Intelligence, Educational technologies, Disabilities, Nigerian Tertiary Institutions, E-learning

I. Introduction

An overview of the role that Information and Communication Technology (ICT) can play in advancing special education for kids in mainstream classrooms is given in this article. Globally, there are currently 79.2 million people with learning disabilities, and the number is rising

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gradually (UNICEF, 2021). Children with learning disabilities have significant special education needs because they have difficulties with listening, thinking, speaking, scientific reasoning, reading, writing, spelling, and mathematics. A pre-recorded voice instructs a five-year-old wearing headphones to repeat everything they hear, word for word. Sentence recall is a test that assesses language, memory, and auditory processing abilities. It is one of many tools employed by speech-language pathologists (SLPs), schools and other organizations to screen children at risk for speech and language disorders (SLD). AI has been used to support students with disabilities for many years for diagnosis and intervention purposes (Drigas A., & Ioannidou R.E., 2013). Drigas and Ioannidou (2013) reported that AI could be used to diagnose or screen for dyslexia and also for symptoms of disabilities such as lower attention levels (Drigas A., & Ioannidou R.E., 2012). AI has the potential to automate the scoring of essays, identify students with disabilities reading and writing difficulties, create psychological profiles for students with disabilities and estimate their spelling difficulties. However, these studies primarily focus on screening and diagnosis of learning disability (Rauschenberger et al., 2019; Rello et al., 2018; Zvoncak et al., 2019). "The study as well as moral practices which is used in enabling knowledge through refining functioning by producing, exploiting, and management of proper high-tech developments and assets" is how the Association for Educational Communications and Technology (AECT) defines educational expertise (Januszewski A, & Molenda M., 2008).. For instance, the three million students with distinct learning and mental issues can stay up to date with their friends without disabilities by using supercomputer knowledge for word processing, communiqué, study, and software developments.

Additionally, computer technology has facilitated the creation of advanced tools that can assist the two million more severely disabled students in overcoming a variety of barriers that prevent them from participating in the classroom, such as blindness, severe physical disabilities, and speech and hearing impairments. However, the cost of technology is a significant factor for many institutions, and many teachers lack the necessary training to use it in their classes. Expertise can be used by all instructors who want to combine knowledge when teaching as good as scholastic supervisors (Jaflah. A., 2012). Thus, while computer technology can act as an equalizer by freeing many students from their disabilities, the barriers to inadequate training and cost must first be overcome before wider use can become a reality.

Today's children are the first generation of the "digital age." They are being raised in a society that is changing rapidly as a result of the influx of new computer-based technologies that provide more pervasive and faster worldwide links to commerce, communication, and culture. The dramatic changes over the past decade have prompted the Presidential Committee of Advisors on Science and Technology. Many educators think that integrating technology into classrooms will result in significant changes and they feel new-fangled supercomputer and communication-based technologies (CBT) have a lot to teach (Baker, T., & Andargie, J., 2013). Initiating usage of computer created instruments in the laboratory for pupils who are normally functioning is widely praised. Fewer people are aware of the numerous advantages that computer-based technologies can provide for kids with impairments. The main topic of this article is how computer technology

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can help advance special education for kids in the classroom. It starts with a summary of the various special needs and disabilities that children have followed by an introduction to the ways in which technology can support those requirements. The following sections drive into greater detail on how specific computer programs and gadgets enable pupils that have incapacities to receive an education inside a normal classroom together with their equals without disabilities. This concluding part discusses the obstacles that need to be removed in order for schools to give pupils that have incapacities more opportunities that will make them study beyond expectations in traditional schoolroom locations. These obstacles include those that prevent the promising technology from being used more widely.

Who Are the Children with Special Needs?

The number of students with disabilities has been steadily rising over the past 20 years, outpacing both the general population and school enrolment. Numerous educationalists view technology as a tool to improve knowledge as well as make lessons more enjoyable for students and make management more proficient. Active technology use simultaneously employs numerous confirmation-built policies e.g., adaptive content, recurrent testing, speedy feedback, etc.) (Ross, S. M, 2010).

Presently, about one in every six students in Nigerian schools is unable to fully benefit from conventional educational programs due to a disability that limits their participation in classroom learning. According to federal regulations, students with special needs are those who, because of a physical, emotional, or cognitive impairment, require specialized instruction and supportive services to reach their full academic potential. Government data from the 1997–1998 academic year indicates that over five million children aged 5 to 18 were enrolled in special education programs. As illustrated in Fig 1, these students exhibited a range of disabilities, from speech and language challenges to intellectual impairments, with the majority classified as having specific learning disabilities often linked to psychological conditions. The nature, severity, and impact of disabilities vary widely among children, both in terms of the type and number of impairments. Despite this diversity, demographic data on students with disabilities reveal several common characteristics:

a) More than half of all students receiving special services are males.
b) Most are in elementary or middle school.
c) Most have no obvious disability; they have problems that are primarily academic, emotional, social, or behavioral.

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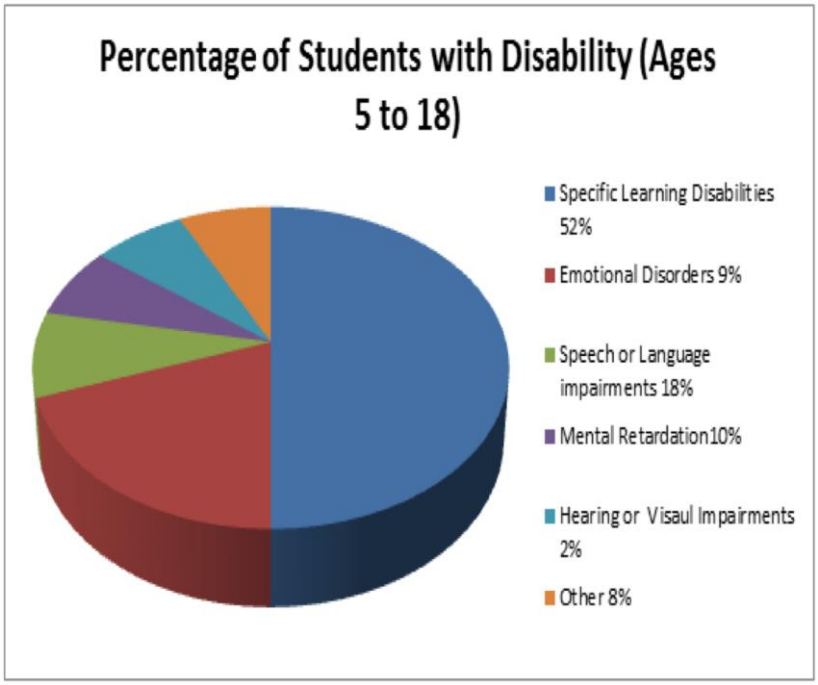

Fig.1. Percentage of students with disabilities (Source: After A Mamatha, K. L. L. Lavanya, G. Radhika, Sai Leela Rani, 2022)

Federal law requires special education services to be provided to all children with disabilities. In Fig.1 Parents are usually eligible to a specific education program at no expense to them if their kid qualifies for special schooling or education services. Whether the program is implemented in a classroom, physical education environment, the child's residence, a clinic, or even a different organization. It must accommodate the child's specific needs, including any modifications that may be required to the location of teaching. Additionally, students with exceptional education documentation are entitled to every correlated service such as physical and professional physiotherapy that are vital to satisfy their unique studying requirements.

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Continuum of least Restrictive Environments

Outpatient programs (assignment of pupils governed by second school system)	
LEVEL I	This are children in regular classes including those who need counselling therapy with or without disabilities
LEVEL II	Regular class attendance plus supplementary instructional services
LEVEL III	Part-Time special classes
LEVEL IV	Full-Time special classes
LEVEL V	Special stations
LEVEL VI	Homebound
LEVEL VII	Instruction in hospital or domiciled setting
	Non Educational services (medical and welfare care supervision)
Impatient Programs (assignment of children of facilities governed by health or welfare agencies)	

Fig.2. Continuum of least restrictive Environments (Source: After Westat. Judith Holt, Rod Paige, Robert H. Pasternack, Stephanie Smith Lee, 2001)

Federal regulations mandate that students with special needs should be educated in the least restrictive environment (LRE), which spans a range from traditional classroom settings to more intensive options like residential institutions. See Fig. 2. In recent times, there has been a growing push to include all students with disabilities in mainstream classrooms, regardless of the severity of their condition. This practice, known as full inclusion, has led to an increasing number of students with special needs being placed in general education settings, prompting educators to develop effective strategies to meet their unique learning requirements

Technologies for Students with Mild Learning and Behavioural Disorders

School children that have studying incapacities and emotional complications, reports show that almost 60 percent of entire children getting unique services in schools today. Their numbers are increasing every year. These school children repeatedly have persistent education and behavioural problems at school. This problem can only become evident after teachers work with the school children for weeks or months. Students with mild learning disabilities are often broadly categorized as having difficulties in academic and social development due to their

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disabilities, with these challenges frequently continuing despite teachers' efforts to support them within standard classroom settings. While many of these students spend part of their day in general education classrooms, they often struggle to match the performance of their peers without disabilities. Additionally, teachers may find it challenging to provide the individualized attention these students require. Educational technology has emerged as a valuable tool to support their learning, offering personalized activities such as drill exercises, simulations, exploratory tasks, and communication tools that align with each student's needs and abilities. Study grounded in general learning theory applicable to both students with and without minor disabilities indicates that computer-based instruction, when thoughtfully designed and implemented, can significantly improve students' mastery of skills and subject knowledge. The ultimate goal of a teacher is to help students develop knowledge and skills that can be used in real-world settings. Many computer-based applications such as the Internet, communication technologies, CD-ROM reference materials and multimedia presentation tools can provide opportunities for students to use their skills to engage in real-world projects (Roschelle. B, 2000). In the following sections it observes numerous kinds of computer actions that are being incorporated into laboratory classes teaching seem to have substantial benefits for school children with slight incapacities. Word processing and word prediction software, communication and networking technologies, and the use of hypertext and multimedia projects (Henniger M. L, 2004).

Word Processing Software: Word processing's qualities that make it a useful learning aid for kids amid unique desires are typically the similar qualities that make it useful for kids in general. Examples of word processor features that lead to better writing include the ease of text revision, the creation of clear and legible text, and the sense of authorship. According to research, pupils are more inclined to make the necessary edits to their work using a word processor than on handwritten drafts. Students can devote more attention to the content of their written works because the word processor relieves them of the most tiresome editing responsibilities.

Word Prediction Software: An additional instance of supercomputer-centred technology that can assist pupil's interconnection in scripted language is word prediction software. Whilst used in combination alongside conventional word processing software. This software helps students of various skill levels with their spelling and lessens the number of keystrokes required to enter words.

Communication Technologies: Using supercomputers aimed at Internet communication and networking actions can expand the learning environment beyond walls of the school room and enable school children that have incapacities to access and transfer info literally all over globe just like other regular students. However, improved systems of access and delivery do not necessarily lead to improved instruction. On the contrary, improved learning depends on the quality of instruction and not on the medium through which it is delivered. Communication technologies become a powerful learning tool only if they offer opportunities for students to

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gather a wide range of resources and information and then exchange their thoughts and ideas in collaborative learning environments.

A list of Technologies for Students with Speech and Language Disorders

One of the most crucial components of life is communicating with others. Speech and language impairments address problems in communication and related areas such as oral motor function (Brice. A., 2001). Of course, effective communication is important in classrooms where teacher-student or peer-to-peer exchanges are a vital part of the learning process. But communication requires at least two individuals to send information and the other to receive it, and problems arise when a break occurs at either end of this chain, which is common among students with communication disorders Two general types of communication disorders qualify a student for special education services: speech disorders and language disorders. Note: other named disorders are Dyslexia and Dyscalculia. Dyslexia: is a learning disorder that involves difficulty reading due to problems identifying speech sounds and learning how they relate to letters and words (decoding). Also called a reading disability, dyslexia is a result of individual differences in areas of the brain that process language. While Dyscalculia: is a learning disorder that makes it difficult for someone to understand and use numbers and math concepts, even when they have a normal intelligence. It affects a person's ability to comprehend, recall, and use numerical information, and can cause difficulties with basic arithmetic, counting, and estimating. A speech disorder occurs when the articulation, voice quality, or fluency patterns of the speaker impair the ability of the listener to understand the speaker's intent. A language disorder occurs when either the message's sender or receiver cannot use the communication language's sounds, signs, or rules. Table 1: Shows devices that can assist these students with disorder.

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Table I. Devices to assist students (Source: After A Mamatha, K. L. L. Lavanya, G. Radhika, Sai Leela Rani, 2022)

Devices to Assist Students with Hearing Impairments
1. Hearing Aids: The earshot assistance is a user-used (listener) tiny broadcast address method. It works best in quiet, structured settings where the speaker is only a few feet away and there is minimizing extraneous noise. Hearing aids are usually available in four styles: body-worn, back-ear, eyeglass, and in-ear. Children of school age use postauricular hearing aids most often, which are designed to fit unobtrusively behind the ear. Hearing aids can help or benefit nearly all persons who have hearing damage, involving "nerve injury".
2. Frequency-Modulated (FM) Amplification Systems: The FM transmission device, also known as an auditory trainer, makes a straight connection amongst the instructor wearing a microphone and the student wearing a hearing aid. Background sounds are condensed in this system and it is free for teachers and students to move around the room. Due to their adaptability and portability for use both inside and outside of the school. Frequency-modulated techniques have existed and are used by educators and school children in classrooms for over 40 years and continue to rank among the most widely used auditory enhancement tools in educational institutions.
3. Audio Loops: This facility was established with efforts to address the requirement to regulate teacher's voice volume, preserve auditory signals between the home and school, better manage background noise, and allow for maximum mobility in the classroom. The audio loop is a modification of the FM device mentioned above that sends sound straight after its source to the hearer's ear via a particularly designed earshot aid. Radio waves or a wire can be used to transmit sound.
4. Infrared Systems: Hearing-impaired listeners can now hear clear, pure sound through infrared technology. Without the inconvenience of wires and cords, they improve hearing in public areas and are less susceptible to interference after beepers alongside additional outdoor radio signals. However, their accessibility may be restricted due to the line of site problems or space amid the transceiver with emitter. Nonetheless, infrared systems are becoming more and more common as prices come down.
5. Cochlear Implants: The cochlear implant, a device surgically placed beneath the skin, works by bypassing the damaged sections of the inner ear and directly stimulating previously inactive auditory nerves. It continuously transmits signals in response to surrounding sounds, while specialized components within the speech processor help filter out unwanted background noise. Unlike conventional hearing aids that amplify sounds, the cochlear implant provides auditory input to individuals with profound hearing loss, allowing them to perceive sounds that were once inaudible. This advanced technology represents a significant development in assisting those with severe hearing impairments.
6. Telecommunication Devices for the Deaf (TDDs): The most popular telecommunications equipment in use today is the TDD, which enables a person who is deaf or hard of hearing to make and receive phone calls. The TDD, which looks like a little keyboard with a screen, is connected to a phone to show inward or outward mail. Certain TDDs feature a kind of

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printout on paper so that a lasting record of the discussion can be made. In order to make use of the TDD, the operator inputs a message through the keyboard which is then spontaneously translated to sounds then sent around the phone line to alternative TDD, where it is converted back into text. For intellectual and social reasons, these technologies enable students with disabilities to engage with one another outdoor the classroom, much like their peers without disabilities do, even though they are not commonly utilized in the classroom. Both the message's sender and recipient need to have access to the technology in this system.

7. Captioned Television: Adding writing to a visual demonstration so that spoken words are seen as text is known as captioning. Early captioning was mostly thought of as captions aimed at translating foreign movies. Here are two kinds of subtitles: closed and exposed. Since open translations cannot be turned off, it is rarely used and is thus disliked by the public. On the other hand, closed captioning is widely used and is a feature that may be enabled or disabled on any contemporary television. Since 1993, all television producers have been obligated to incorporate decoders into their devices so that persons that have earshot deficiencies can contact closed translations on TV shows as well as films for enlightening and leisure reasons. A lot of classes and reserved residences in this country develop access to this machinery because people purchase over 20 million televisions annually.
8. Live Speech Captioning: Real-time speech captioning is another form of this technology that allows individuals with hearing loss to view spoken words as they are being said. This device operates in much the same manner as steno keyboards used to record court sessions. Usually a stenographer writes information when captioning is utilized in educational settings when the tutor speaks the script is shown on a computer screen. With such technology has shown that it is very useful for scholars that have earshot impairments who attend school classes or open lectures

Nowadays, a significant portion of broadcast television is captioned, giving those with hearing impairments equitable access to entertainment and public information. Less than 10% of instructional videos had captions as of 1998, despite the fact that the majority of shows on national networks and cable television channels, as well as hundreds of films and documentaries, have captions. More captioning could enhance reading instruction and provide possibilities for kids with hearing loss.

Materials and Methods

At this stage, we discovered that several AI applications are used to help kids with disorders learn, and there are a variety of ways that the technologies are combined to help them learn. The results of this review study have demonstrated the potential of AI in supporting the learning of students with disorders, as the study's focus is specifically on finding research on how AI can be used to support the learning process of students with disorders rather than the diagnosis or identification of a learning disability. Table 2: Shows some tools that assist Students with Speech and Language Disorders using Artificial Intelligence (AI).

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Table 2. List of AI-based tools and technologies designed to support students with speech and language impairments (Source: After OpenAI, 2024).

S/N	AI Technology	Examples	Function
1	**Speech Recognition Software**	Google Speech-to-Text, Siri, Dragon NaturallySpeaking	Converts spoken language into written text to aid students with writing.
2	**Text-to-Speech (TTS) Tools**	Microsoft Azure TTS, Amazon Polly, Read&Write	Reads text aloud to support reading and language comprehension.
3	**AI-Powered AAC Devices**	Proloquo2Go, Talkitt, Avaz AAC	Enables communication through symbol or text-to-speech systems.
4	**Natural Language Processing (NLP) Tools**	Grammarly, ChatGPT, Microsoft Editor	Assists with grammar correction, expression, and language understanding.
5	**AI-Based Language Therapy Apps**	Otsimo Speech Therapy, Speech Bulbs, LingoTalk	Offers interactive and gamified speech therapy exercises.
6	**AI Virtual Assistants**	Google Assistant, Alexa for Education	Promotes spoken interaction and communication practice.
7	**Personalized Learning Platforms**	CogniToys, AI-powered IEP tools	Customizes language learning based on individual pace and ability.
8	**AI Diagnostic and Assessment Tools**	SoapBox Labs, AI-based screening apps	Supports early detection and monitoring of speech/language issues.

Redefinition, the last and most advanced stage of AI integration, is redefining a learning task with human help to the point where it would not be feasible without the AI technology. Zingoni et al. (2021) introduced AI technology at the redefining level with their BE SPECIAL software platform. Expert clinical reports and user self-assessment questionnaires regarding study-related issues and useful remedies are used by the BE SPECIAL program for each user. The outcomes of these evaluations assist in determining which tools and techniques would be most beneficial to the user.

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Barriers to the Effective Implementation of Educational Technologies in Instruction and Learning Environments.

Assistive Technologies Assistive technologies are devices or software designed to aid individuals with specific disabilities in learning or performing tasks. Examples include:

1. **Screen readers** (e.g., JAWS, NVDA): Help visually impaired students interpret text on a screen.
2. **Text-to-speech and speech-to-text tools**: Benefit students with dyslexia, motor impairments, or speech disabilities.
3. **Braille translation software**: Converts digital text into Braille for students with visual impairments.
4. **Interactive whiteboards and captioning software**: Useful for hearing-impaired students.

Online Learning Platforms: Platforms such as Moodle and Google Classroom, when configured with accessibility features, can serve as inclusive educational spaces. Features like closed captioning, keyboard navigation, and screen reader support improve accessibility. **Mobile Applications:** Mobile apps provide flexible and portable access to learning. Apps like Proloquo2Go and Voice Dream Reader offer communication and reading support for students with cognitive or speech impairments.

Implementation Challenges

Despite the promise of IT, several barriers hinder its widespread adoption for students with disabilities: Addressing these challenges requires multi-stakeholder engagement and inclusive policy-making. Despite the promise of IT, several barriers hinder its widespread adoption for students with disabilities: Addressing these challenges requires multi-stakeholder engagement and inclusive policy-making. While Information and Communication Technology (ICT) holds significant promise for enhancing educational practices and improving the overall quality of teaching and learning, its potential benefits are often not fully realized (Surry. D. W, & Farquhar. J. D, 1997). The limited integration of educational technology in many schools can largely be attributed to factors such as inadequate infrastructure, insufficient funding, and a lack of adequately trained teachers to effectively implement these tools (Drigas A., & Ioannidou R.E., 2013). In addition, several other challenges have been highlighted by researchers, including:

a) **Inertia**: A number of educators in Nigerian higher education institutions demonstrate resistance to embracing modern technological innovations, expressing a preference for traditional instructional methods that have been used for decades. (Aziz. H, 2010).
b) **Cost**: Integrating educational technologies into the teaching and learning process can be financially demanding, primarily because of the substantial cost associated with ICT tools and infrastructure. Due to the expense, some Nigerian universities are unable to install certain ICT facilities. Though some higher institutions may be able to afford them, they do not believe that spending so much money on educational technology will enhance teaching

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and learning. In this sense, insufficient finance turns into the scourge of our educational advancement. Curriculum innovation in the paradigm under discussion will be a pipe dream without sufficient financing.

c) **Unavailability and Inaccessibility of ICT Facilities**: Lack of access to ICT facilities, such as computers and the internet, can significantly hinder what teachers can do in the classroom as it relates to the implementation of its program. In Nigerian tertiary institutions, many teachers lack access to ICT facilities because they are either absent or not present in the expected quantity.

d) **Computer Literacy**: Using educational technologies is also hampered by teachers' and students' inadequate computer literacy. As previously mentioned, some educators are unwilling to embrace technology in the classroom and would rather stick to the time-honored teaching approach. Their inability to use computers and the internet effectively makes it extremely difficult for them to incorporate instructional technologies into their lessons.

e) **Lack of trained personnel to operate and maintain assistive tools:** A significant challenge in accessing and effectively using assistive technologies is the lack of trained personnel to operate, maintain, and troubleshoot these devices. This shortage can hinder the ability of individuals to benefit from assistive technologies and can even lead to devices being abandoned or causing physical harm.

f) **Poor internet connectivity in rural areas: Due to p**oor internet connectivity in rural areas is a significant issue globally, leading to a digital divide that impacts education, economic development, and access to information. This lack of access stems from factors like limited infrastructure, high costs, and the physical distance of rural areas from urban centres where infrastructure is typically more developed

g) **Cultural stigma and low awareness among educators and policymakers:** negatively impact mental health by deterring individuals from seeking help, hindering their recovery, and leading to discrimination and isolation.

h) **Inadequate power supply:** Inadequate Power supply poses a significant challenge to the adoption of educational technology, as electricity in many regions remains unreliable. While diesel generators are often used as an alternative power source, not all tertiary institutions can afford to purchase or maintain them, let alone consistently fund the cost of diesel fuel required to operate them.

Conclusion

These current research results have shown that Artificial Intelligence (AI) with the assistance of Instructive Technology has an affirmative impact in enhancing student performance and overall processes of teaching and learning. Nevertheless, Nigeria’s Higher Institutions should be prepared to acquire updated software and hardware and set up necessary ICT infrastructure to support the effectiveness of student learning and for the academic staff alike. Therefore, before institutions decide to adopt certain Educational Technologies, strategic planning needs to be developed in which their vision and mission should be identified and integrated into their strategy along with the needs of teaching and learning processes. It is essential for the Nigerian government to acknowledge the critical role of technology in enhancing the quality of education

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and learning outcomes. The appropriate management ought to fund institutions with a financial plan explicitly for the introduction of AI technology to facilitate its teaching and adoption as a national policy for the 21st century.

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