CHAPTER 20

THE IMPERATIVE OF ASSISTIVE AND ADAPTIVE TECHNOLOGIES IN SPECIAL NEEDS EDUCATION DELIVERY

Terfa Ahon Adaka, Ph.D
Federal University of Lafia
Njideka Ifeoma Okoroikpa M.Ed
Ebonyi State College Of Education, Ikwo
Beth Nnenne Oluka, Ph.D
Ebonyi State University, Abakaliki

Introduction

Technology has great potential for delivery of quality and appropriate education to learners with disabilities. This is because it enables active participation and completion of students with disabilities (SWDs) in learniU7UJKKL,Sng tasks. SWDs are students with physical, mental or sensory impairment that significantly limits copying with conventional educational arrangement in completion of learning task to the extent that they require Special Education delivery approach. According to Encyclopaedia Britannica (2022), Special Needs Education delivery refers to the special methods of educating learners who differ socially, sensory, mentally or physically from the norm to the extent that they require some forms of modification to conform to the regular school practices. Such special methods of education become imperative for the education of SWDs to be successful. In other words, the imperative of special needs education delivery becomes a requirement for successful learning outcome of SWDs.

Assistive and adaptive technologies can be used in a variety of ways in the classroom to support learners with special needs to enhance their learning outcome. The study of Adaka, Ezugwu and Jibrin (2020), on the extent of assistive technology devices usage in inclusive classes by Junior Secondary School teachers in Lafia, Nasarawa State, Nigeria, found that assistive technology is imperative to SWDs' achievement in learning tasks that would not have been ordinarily accessible. The application of assistive / adaptive technologies in the classroom has greatly aided the paradigm shift in the educational practice from segregation to inclusive education. This is because assistive/adaptive technology devices enable SWDs to be successful in tasks they ordinary would not have been able to perform. Inclusive education according to Andzayi (2012), is an educational arrangement for children with disabilities which spells out that, all learners irrespective of disabilities learns together in neighbourhood pre-schools, schools, colleges and universities with suitable network of support and friendly environment.

Meanwhile, assistive technology (AT) refers to any piece of equipment that is used by people with disabilities PWDs to carry out specific tasks, improve

functional capabilities and independence (Bruinsma, 2011). According to Abani (2015), AT refers to a variety of devices and services that facilitate the inclusion of SWDs in a full range of classroom and social experiences and enable them to function more effectively and independently in their daily lives thereby improving their quality of lives. On the other hand, adaptive technology refers to modified versions of already existing technologies that promotes functional capabilities and introduces different ways of interacting with the technologies to the extent of accomplishing specific tasks (ACT Center, 2022).The adaptive part of the device refers to making a change that makes it easier for the person to use the tool based on how their body is different from the typical body. The adaptation of the technology allows PWDs to use the modified technologies to perform special tasks based on their unique characteristics. Assistive/adaptive technology provides credible devices to teachers who work with SWDs. Such devices enable teachers to provide new and more fascinating means of individualizing instruction according to the individual needs of SWDs. Teachers can use technologies to facilitate learning and to provide disability friendly learning environment that can promote all leaeners' full participation and equitable learning outcomes (Adaka etal, 2020).

The imperative of assistive/adaptive technology devices cannot be over-emphasized in enhancing learning outcome of SWDs. A study conducted by Abani (2015) affirmed the importance of assistive technologies (ATs) to students' completion and success in tasks that would otherwise be inaccessible. However, allowing learners the prospect to achieve learning tasks in the classroom is a major concern of all stakeholders in education sector including the learners themselves. Contemporarily, there is a paradigm shift in the mode of education from exclusive to an inclusive model that allows learners with diversity in regular classrooms. This shift has increased the need for teachers to adopt varied teaching styles to meet the special learning needs of all learners within the general classroom. Undeniably, technology is crucial for successful learning outcome of learners in regular classes because it "enhances full participation of learners in the teaching-learning processes and aids learners on individual basis to access and organize learning tasks" (Coulon, 2015:45). Therefore, there are a variety of technologies from low to high items as well as software that are regarded as assistive/adaptive technologies. For instance, an AT device can be a pencil grip that is cheap to acquire or it can be a personal computer (PC) with a word processing App that is reasonably expensive. The core objective of AT is to assist SWDs contribute in all classroom activities and complete tasks they ordinarily would not be able to complete (Liman, Olanrewaju, Jerry & Adewale, 2015). Therefore, AT allows SWDs to achieve tasks that they would not naturally be able to do without the essential networks to be successful in the regular classrooms. Recently, Individual Education Program (IEP) team members are obliged by law to consider appropriate technology for every child when developing IEPs (Coulon, 2015). Technology is an essential determinant for consideration to support a child's placement in the least restrictive environment. Using technology promotes flexibility, enhances interactive

participation and differentiation of instruction. In addition, it helps SWDs to feel as part of the learning community.

This chapter therefore defines the concepts of assistive and adaptive technologies, their benefits to SWDs and considers varied types requiredfor the special needs learners.

Going by the layout above, this section should begin with the definitions of assistive/adaptive technologies before stating the impact.

Please rearrange the article in that order.

Impact of Assistive Technology to the Education of SWDs

Assistive technology(AT) has offered more credible and efficient tools to teachers who work with children with special needs. Such tools enable teachers to provide new and more fascinating means of teaching and learning while individualizing instruction to meet the diverse needs of all learners. Teachers can use computer sets as devices to promote teaching and learning processes beyond drill and practice, to facilitate learning outcome and enhance equitable learning environments so as to accommodate all learners.

AT could be equipment or software that aids SWDs to learn, communicate or function more actively in life. This can be high-tech like personal computer (PC) or low-tech like a walking stick. AT can be seen as the use of any piece of item, equipment or software to facilitate independence of learners with disabilities. Specifically, AT helps to:

- promote independent living skills of SWDs
- facilitate retention and recall of learned tasks
- reduce probable risks in and around the home
- ensure mastery of self-help skills
- reduce the stress on care givers and improve the quality of life of the person being cared for (Oxfordshire Country Council, nd).

The Impact of Adaptive Technology to the Education of SWDs

Impairment or disability of various kinds affect persons from performing certain basic tasks independently. These functions include walking, seeing, hearing, speaking or just being able to grasp or lift objects. The inability to perform these functions not only affects the independence of persons with disabilities (PWDs) but also interfere with their ability to cope in classroom activities and working environment independently.

The innovative application of technology has helped PWDs to perform essential functions on their own. From simple wheelchairs to advanced speech recognition and home automation.Adaptive/ assistive technologies have helpedseveral people gain independence at home, school and work place. The adaptation helps PWDs to complete a specific task. Adaptive technology means where existing devices or equipment are adapted for use by PWDs. For example, a person without hands can use speech recognition or eye movement software

instead of computer keyboard to give command to computer. Specifically, adaptive technologies help to:

- break the barriers for PWDs in their daily lives
- facilitate access to appropriate and quality educational programs.
- Meet the needs of individual learners under inclusive settings
- Ensure higher flexibility and differentiation in educational approaches
- Enable learners to understand exactly how what is learned is applied in practice

Relevance of Assistive/ Adaptive Technologies

Assistive/adaptive technologies play the following roles in the education of PWDs according to Sagstetter (2002),

1. Assistive technology provides alternatives that enable PWDs to be more independent, productive, and included in society and community life.
2. When speech devices or strategies are used in the classroom, not only do they provide means for children with hearing disorder, but it also facilitate meaningful participation and communication for all students in the class
3. It is the key to ensure full participation of students with diverse needs in inclusive settings.
4. Assistive technology is critical and facilitates the support and full participation of PWDs in their daily chores and learning tasks.
5. Assistive technology increases meaningful participation of PWDs across school, home, work and community settings
6. Assistive/adaptive technologiesare only the beginning of a long road to independence. By combining a few simple tools and strategies, SWDs can increase their meaningful participation in school, home, work and community settings
7. Technology can increase access to new experiences, new activities and new environments, bridging the gap imposed by disabling condition
8. It affords them opportunities that are taken for granted by individuals who do not have disabilities
9. Increased self-motivation
10. Increased independence and rate of completion of a given task
11. Accountability and learning outcome
12. Expanded learning and life experiences

Classifications of Assistive Technology

Your mixing assistive technology with adaptive technology is confusing. It would be better to treat each distinctively.

Assistive technology is variously classified. However, this chapter considers only two forms of classification. According to Gitlow (2000), classification, assistive technology is classified as:

i. Low Tech Assistive Technology: ATDs that are considered under this category are normally very easy to use, inexpensive and do not require electricity to function like graphic organizer, visual magnifier, adapted graph and map.
ii. Mid-tech Assistive Technology: These are ATDs that are also easy to function however, they need electricity to be operated. They are more expensive than the low tech devices like screen magnifier, audio book, adapted CD player/music player, voice amplification etc
iii. High tech Assistive Technology: These are devices that are complex to operate and are programmable. These include equipment that require computer applications, electronics or microchips to perform a specific function like smart board, personal computer, electronic wheelchair etc

In addition, Wall (1999), classified assistive technology as:

i. Personally: These are technologies or equipment that are to be used by an individual SWD. For instance, a pair of color blind glasses to enable a learner to move and navigate within the immediate environment
ii. Developmentally: These are ATDs that can be shared among SWDs in the school. Such tools assist in meeting a special educational need that is based on some developmental disorders which in the future may be overcomed. Such ATDs may not be required again thereafter by the individual.
iii. Instructionally: Under this classification, the ATDs are used subject to the modification of the end user as the individual progresses to the next level. The ATD in the next class is needed in order to accomplish the requirements of the new class.

From these classifications, Gitlow's does not specify the devices to be used for specific form of impairment or disability. On the other hand, Wall's classification specify that the developmentally and instructionally can be shared among SWDs in the class whereas the personal devices are not.

Classifications of Adaptive Technology Does this stand alone for adaptive technology or represent both adaptive and assistive?

There are varied forms of adaptive technologies based on the type of assistance each offers. According to Study.Com (nd), these include:

i. Mobility Equipment: Most of the people aged from 65 years and above use mobility canes, crutches and wheelchairs to support their movement. These older persons are mostly at risk of depression and isolation with reduced mobility. This explains why adaptive equipment is very essential for this category of persons to aid their mobility.
ii. Daily Living: Under this form, it involves a spectrum of devices that aid individuals with daily living skills. Under this category, the products range from bath railings to reaching devices, hearing aids, and feeding aids. Most older people need help with certain everyday activities such as eating, bathing/toileting, getting in and out of a bed/chair. Daily living aids make

it possible for individuals to fill many of these needs. Examples of adaptive devices for daily living include:

- adaptive Equipment for Dressing: Dressing sticks, sock aids, long-handled shoe horns, button hooks, elastic shoelaces
- adaptive equipment for bathing: Tub or shower chair, handheld shower, grab bars, transfer board or a mechanical lift etc
- adaptive Equipment for Toileting: Commodes, grab bars, specialized height toilets, toilet aid to assist with cleaning the perinea area, leg straps to help lift legs etc
- adaptive Equipment for Eating: Adaptive utensils, non-skid bowl, plate guard, scoop dish, long straw etc

The listabove is not exhaustive but represents the most common adaptive devices that could be helpful to certain individuals.

iii. Adaptive Equipment for Instrumental Activities of Daily Living: Instrumental activities of daily living are exercises that are meant to improve daily life beyond the basic daily tasks. Products under this category aid in communication, cognition, leisure and safety. Adaptive products for leisure include adaptive toys and sports materials. In terms of safety, wearable call buttons and fall detection devices are types of adaptive equipment.

Assistive/Adaptive Technologies for Varied Disabilities

The following technologies will be discussed based on the varied categories of disabilities that are commonly identifiable as discussed by Berkeley Web (2020):

Visual Impairment

The following are some of the available assistive/adapted technologies for persons with visual impairment:

a. Cane: Various types of canes are available for use by persons with visual impairment. Most of them are long and can assist individuals with blindness or low vision navigate around with utmost confidence

b. Service dogs: These are dogs that are specially trained to assist their owners with disabilities on errands, remind them to take medication and so on. Such dogs can accompany their owners to public places such as airports where pets are not allowed.

c. Ultra Cane: It is an electronic device meant to aid mobility with a long cane. The cane emits ultrasonic waves to enable users detect objects in their front.

d. JAWS Screen Reader: The acronym JAWS refers to 'Job Access with Speech'. It is a popular software reader that works with Windows operating system and provides text-to-speech and braille output.

e. Kurzweil Education: This is text-to-speech software that aids persons with visual impairment operate computers and can also read scanned printed documents.

Hearing Impairment

There are basically three types of technologies for learners with hearing impairment. These are:

- Assistive listening devices (ALDs): These aid to intensify the sounds for the person with hearing loss especially where there is significant noise from the background. ALDs can be used with a cochlear implant to help the user process certain sounds better. ALDs help in transmission of sound for people with hearing loss. ALD systems for classrooms, theatres and other large facilities include hearing loop systems, frequency-modulated (FM) systems and infrared systems.
- Augmentative and alternative communication (AAC) devices: These are devices that help persons with hearing impairment in expressing themselves. These devices range from a simple picture board to a computer software that synthesizes speech from text. The commonest example of AAC device is a picture board/touch screen that uses pictures/symbols to represent typical items and daily activities in the individual's life eg the individual touch the image of a glass to ask for water to drink. Picture boards are customized based on the individual's age, immediate environment, education, occupation and preferences.
- Alerting devices: These aids are connected to a doorbell, handset/telephone or alarm that emits a loud sound or blinks light to draw the attention of a person with hearing disorder. Alerting devices use sound, light, vibrations or a combination of these to let someone know when a particular event is occurring. Clocks or alarm system enable a person with hearing impairment to wake up to flashing lights, loud noise or a vibration. There are also visual alert signal monitors eg when the phone rings, the visual signal alert is activated and the phone vibrates or flashes a light to let the person know.

Orthopedic Impairment

Orthopaedic impairments are caused by a congenital anomaly, accident and disease conditions such as Cerebral Palsy, Spina Bifida, Paralysis and Muscular Dystrophy. Most learners with orthopaedic disorder lack fine or gross motor skills or both and require the use of technologies such as:

- Wheelchairs
- Adjustable tables
- Walkers
- Feet chair glides
- Alternative grip tools
- Canes
- Special chairs/desks for comfortable sitting positions
- Adaptive equipment for recreation such as adjustable basketball hoops
- Catchers to help a student practice catching a ball
- Voice recognition software for those who lack fine motor skills

Emotional and Behavioural Disability (EBD)

EBD is very challenging for teachers considering that there are very few appropriate devices available to meet disruptive needs of the student in the classroom, making it hard for the child and others to concentrate and complete a learning task. The following technologies are however recommended:

a. Text-to-Speech Software: For many students with EBD, the actual learning task expected of them can trigger more frustrations and intolerance to complete a task particularly reading. A text-to-speech software is found to be useful as an ideal solution. Students with EBD can sit in a relaxed mood and listen while the computer reads to them. This prevents them from trying to engage too many brain tasking activities at a time.

b. Reminder Devices: Students with EBD tend to be easily distracted during lessons. A reminder device like a vibrating clock can be a good way to get their attention back. It prompts them to refocus on the task at hand without teacher's intervention. Through this they can feel significantly independent while teachers have fewer reasons to chastise them.

c. Voice Recognition Software: This application can be installed on their tablets (or computer) where it does not exist. When a student with EBD struggles with transmission of their thoughts into paper and pencil, teachers can consider allowing such a learner to use the software. This offers them an opportunity to say what they want to write while the computer handles the writing. Through this, the learner can overcome the frustration that comes from lack of fine motor skill or the inability to concentrate.

d. Talk Light: Students with EBD are sensitive to noise. The classroom setting can easily become a source of distraction. Teachers must be careful of the volume of noise in and around the classroom at any given time. Talk light can help to monitor the volume of noise in the class at a time. It provides a meaningful way to realize when the noise reaches an unacceptable level for the sensitivity of students with EBD. By this strategy, the teacher can ward off some of the negative behaviors amongst students with EBD.

Autism Spectrum Disorders (ASD)

The following technologies can be appropriate for student with ASD:

i. Communication Skills: Students with ASD do experience difficulties with language communication which could be largely be verbal and non-verbal. Some may have difficulties understanding social cues or appropriate conversation topics. The following devices would be helpful:

- Speech Generating Devices: These devicesare portable and contains one or more panels or switches that when it is pressed it activates a pre-recorded speech and synthesizes its output. This can be a standalone device/software that is installed in a tablet or phone.

- GoTalks: These are speech generating devices. They are offered with various amounts of communication options and sizes.

ii. Social Skills: Students with ASD lack intra and inter-personal social skills. Teachers/caregivers may choose to try to develop their social skills with the use of technologies and methods that can aid students with ASD to recognize facial and appropriate behavioral cues in their daily social functioning. Two of such examples include: a. video modelling b. script training. These enable students with ASD to learn social behaviors based on imitation. These social skills can be learned through:
    - FaceSay Social Skills Software Games: These games help students with ASD better recognize behavioral and emotional cues. It improves friendship and relationship among them.

iii. Daily Living Skills: For independent functioning, daily living skills such knowledge of basic hygiene, recreational and self help skills are pertinent. Life skills can be taught through instruction and presentations specifically using special application like:
    - Life Skills Winner: This is software that allows users to score points while learning daily living skills in an interactive environment. The software is accessible from the internet and can be installed on tablets, iPhone, personal computer etc

Implications of AT for Special Education Delivery for SWDs

The imperative of AT on Special Needs Education delivery for SWDs has the following implications:

a. AT application focuses on harnessing the potential of SWDs, thereby facilitating inclusion and reducing discrimination in school settings.
b. SWDs face academic, psycho-social challenges within the school setting. AT enables academic engagement and social participation of SWDs to be more interactive in academic and extra-curricular activities.
c. The deployment of AT products in classrooms ensures that the special learning of SWDs are met and enhances their educational experiences and learning outcome
d. AT ensures that the diversities of all learners are met in an inclusive classroom.

Suggestions

From the foregoing, it is suggested that much should be invested in the design, acquisition and utilization of AT devices having established that AT devices can help to promote self-reliance of SWDs and can improve their livelihood. It is also imperative that schools must decide on AT devices that are affordable, accessible and their technological sophistication must not be too much demanding.

Your suggestions are solely on adaptive technologies. What about adaptive technologies? You summary repeated same lobe sided recap.

Summary

Assistive/adaptive (AT) technologies are primarily meant to improve functional level of SWDs to complete tasks in classroom, workplace or home settings. This chapter explained and distinguished the concepts of AT and also outlined their relevance in the livelihood of PWDs. Gitlow and Wall classifications of AT are also discussed based on usage and sophistication of the device. The chapter finally discussed specific AT devices and their usage according to varied categories of disability.

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