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Introduction to Assistive Technology Types and Categories

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D1.2, D1.3

Learning Objectives

- Define assistive technology (AT)
- Introduce the principles of assistive technology
- Identify functional areas of AT needs
- Identify and explore different types and categories of AT, solutions and use
- Describe the supplementary materials for the provision of AT tools and/or services in various settings

Learning Outcomes

By the end of this unit, you should be able to:

- Describe the broad scope of assistive technology
- Define assistive technology and its benefits for PWDs
- Identify the benefit, use and application of assistive technology and adapted Strategies
- Describe the various technology solutions to meet the need of persons with disabilities
- Identify and describe the major categories of AT

Content Outline

- The legal definition of Assistive Technology Devices and Services
- Impact of Assistive Technology for individuals with disabilities
- The continuum of AT
- Types of AT
- Learning activities/ Instructional strategies
- Resources and additional materials

The legal definition of Assistive Technology Devices and Services

Generally Assistive Technology (AT) is divided into AT devices and AT services. The World Health Organization (WHO) identifies the term as the application of organized knowledge and skills related to assistive products, including systems and services. The Assistive Technology Act (ATA, 1988) defines the AT terms more specifically.

The term “assistive technology device” means any item, piece of equipment, or product system, whether acquired commercially, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities.

The term “assistive technology service'” means any service that directly assists an individual with a disability in the selection, acquisition, or use of an assistive technology device.

When an individual with a disability is required to use AT device(s), an individual's success depends on having access not only to a device but also to the support and services required to use it effectively. Evidently, it is important to differentiate between AT devices and services. The current module (Module 3) focuses on the understanding of AT devices and services.

Impact of Assistive Technology for individuals with disabilities

ADA (1988) addresses that disability is a natural part of the human experience and regardless of the disability, an individual has the right to live independently, and fully be included and integrated into the economic, social, cultural, political, and educational mainstream in their society. When appropriate to the individual and the individual's environment, AT can be a powerful means to increase independence and improve participation.

AT is anything that helps a person do what they want to do. It can help a person become more independent. AT can help in the home, at school, at work, and in the community. The impact of AT improves the health and well-being of individuals' lives and their families.

Various research articles will be assigned to read during the course to find out the impact of the use of AT in various settings.

The continuum of AT

The continuum of AT can range from no and low-tech solutions to high tech solutions. Low-tech AT is any tool that no power is required. They are usually low-cost and easy to use. Examples of low-tech AT are highlighters, overlays, pencil grips, or positioning aids. Mid-tech AT is any simple technology that is operated by a power source (i.e., battery operated), and minimal maintenance is required to use. Some examples of mid-tech are simple communication devices, switches, or dictionaries.

Compared to low or mid-tech AT, high-tech AT are more complex to operate and relatively expensive. In order to use high-tech AT, generally, it is required training for the user and caregivers.

Examples include computer and tablet, dynamic display AAC, Braille device, or eye-tracking system. In addition to the high-tech AT, innovative and emerging technology are also available as AT.

Compared to high-tech AT, specially designed AT, innovative and emerging technologies are integrated accessible features and functions that are universally designed for anyone including people with disabilities. For example, virtual reality can be used for individuals with physical disabilities to travel virtually. The wide range of AT options is known as an AT continuum, which varies in price, operational requirements, or easiness of use.

The continuum of AT provides extensive AT solutions from low-tech to high-tech depending on the individual's needs to accomplish the identified activities and tasks.

It is noted that an individual may need more than one AT solution to complete a task. For example, a child with a communication disorder may use a high-tech AAC device to communicate in the classroom and at home. However, if this child is playing at the playground, the child may use a simple communication board instead of the high-tech AAC as the expansive AAC might be fragile to be broken. Depending on the individual's needs, the environment, and tasks, from low-tech to high-tech AT solutions should be considered.

Types of AT

The World Health Organization (WHO) addresses that over 1 billion population in the world need to access one or more assistive technologies mainly due to their disabilities and aging. AT is frequently associated with expensive and specially designed technology. As the legal definition of AT devices begins with the words “any item”, AT device can be any piece of tool or technology that facilitates any activities involving in a person’s life, including education, daily activities, and employment.

The purpose of the use of AT is to increase, maintain, or improve the functional capabilities of individuals with disabilities. AT can support a wide range of functional areas for people with disabilities. Here is the list of areas to overview what types of AT can support the functional difficulties or challenges of individuals and who can benefit by using them.

- **Seating, Positioning, and mobility**

Seating, positioning, and mobility are very important functional areas for everyone's daily basis. Typical individuals can manage the multiple positions that are required from standing and walking to get where they need to go and sitting in various places. When a person with disabilities has physical challenges to do these, they are greatly impacting their daily functioning (i.e., writing on the desk while sitting on a chair).

They focus on attending to maintain their body position rather than work on their tasks, thereby preventing them from working on their activities, such as learning and working.

Examples of AT for seating, positioning, and mobility

- **Computer and device Access**

People use input devices such as keyboards and mice to access, interact with, and use computers and devices. Many people with disabilities have difficulties using those traditional input devices due to their physical limitations and disabilities. AT for computer access are solutions for providing alternative options to use a computer and device. The AT for computer access include modified/alternate keyboards, mice, joysticks, and switches.

There are some software and alternative access options that support device access, such as speech-to-text software to operate the device, an eye-tracking system to navigate the computer using eyes, or a touch screen monitor for direct selection without using the input device.

Examples of Computer and device Access

Standard keyboards and mouse with adaptions

- Eye gaze system

- Various switches






- **Activities of Daily Livings (ADLs)**

The AT devices for daily livings are to help individuals' everyday activities or tasks such as self-caring, eating, or controlling environments that are difficult or impossible for them to independently complete due to their physical disabilities and limitations or lacks cognitive skills.

Daily living activities would occur in various settings throughout an individual's day in the kitchen, dining, restaurant, bedroom, classroom, or office. AT for daily living activities can decrease the need for other's assistance for people with disabilities to do for themselves.

The use of daily living AT leads for people increased independence with daily living tasks, thereby increased self-efficacy and their quality of life.

Various adapted eating and drinking tools are available. Adapted utensils help individuals eat and drink independently. Self-care AT solutions would support.

Electronic aids to daily living allow persons with disabilities to have better control of their environment. A wide range of input devices is available for the user to access the environmental control with minimum physical movement. For example, electronic aids to control turning on and off the home lights.

Examples of ADLs

Various eating cooking utensil tools

Toileting tools

Dressing tools

Grooming and hygiene tools

- **Hearing**

People with deaf and hard of hearing have difficulties and challenges to access and interact in various environments due to their functional limitations of hearing sound. There is particular technology enhancing sound or providing sound with visual or tactile formats. The main purpose of hearing AT is to provide access to information that people with hearing difficulties can not obtain through their own hearing.

Depending on the individual's needs and environment, various hearing AT can be used. While some devices are more appropriate for use at school, others are more suitable to use at home.

Hearing AT in general is divided into three categories: hearing technology, alerting devices, and communication supports.

Some examples of hearing technologies include FM systems, induction loops, and personal amplification. Alerting technologies would support those individuals to be aware of the sounds in various environments, such as visual or vibrating alerting devices.

Communication technologies can benefit people with deaf and hard of hearing to effectively communicate with others in various settings.

For example, people can use telecommunication supporting systems like phone amplifiers or Telecommunication devices for the Deaf (TDD) or Teletype machine (TTY). Also, many commercially available devices are built-in accessibility for hearing. To access the media, closed captions can be used. Various technologies enable people with hearing loss to communicate effectively person to person (i.e., computer with web camera, text device), and participate in group activities (voice to text/sign, real-time captioning).

Examples of AT for Hearing

Induction Loop

FM Systems

Face to Face Communication Systems

Examples of AT for Hearing

Amplifiers




Examples of AT for Hearing

Amplified Phones

- **Vision**

AT for vision is a technology that supports people to see better, or better comprehend what they cannot see. Some of the examples of AT for vision support include devices and software to magnify printed materials, provide auditory support, and support braille reading. Those AT can be used in a variety of settings based on the needs of the person. This means a person who needs visual supports may access multiple devices depending on the tasks to be completed in the particular setting.

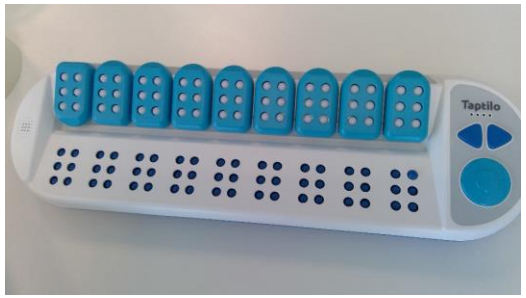
For example, while a person with low vision may use a desktop video magnifier to read at home or work, she/he may carry a handheld magnifier to read labels of products at a grocery store.

AT for vision is used for people with visual impairments, including low vision, blind, or conditions that limit their ability to comprehend visual stimuli. In addition, people with learning disabilities may also benefit from some tools designed for the blind and visually impaired. For example, a person with dyslexia can access audiobooks for better reading comprehension as well as access the reading activity.

Examples of AT for Vision

Various types of desktop and portable video magnifiers

Various Braille devices



OCR Readers

Screen Readers

- **Communication**

Augmentative and Alternative Communication (AAC) refers to the means to promote the communication abilities of individuals whose natural speech is temporarily or permanently impaired. The International Society for Augmentative and Alternative Communication (ISAAC) defines AAC as “AAC is a set of tools and strategies that an individual uses to solve everyday communicative challenges.

Communication can take many forms such as: speech, a shared glance, text, gestures, facial expressions, touch, sign language, symbols, pictures, speech-generating devices, etc.

Everyone uses multiple forms of communication, based upon the context and our communication partner. Effective communication occurs when the intent and meaning of one individual is understood by another person. The form is less important than the successful understanding of the message".

There is a wide range of AAC systems available to support people with communication needs, mainly divided into two categories: aided and unaided. For unaided, it relies on gestures, body language, facial expression, and some sign languages. While aided AAC systems can be a wide range of low tech to high tech AAC to support individuals' effective communication. The use of AAC can benefit people who can not rely on speech for multiple reasons.

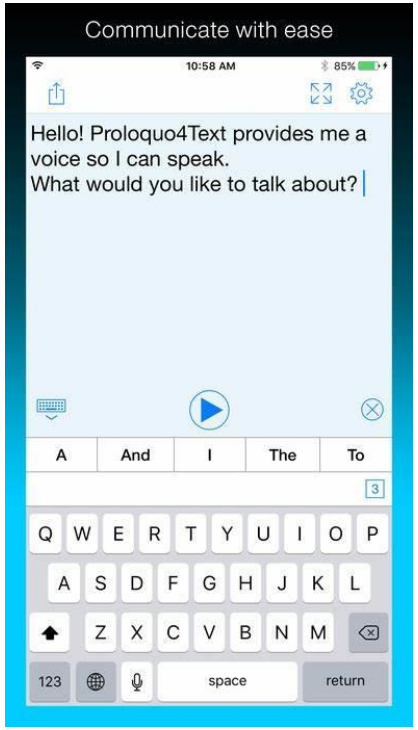
Examples of AAC

Concrete representation, i.e., real objects or tangible symbols

Communication boards with pictures, symbols, letters and/or words

Simple speech-generating devices (SGDs)

Text-based device with speech synthesis



- **Physical Education, Leisure, and Play**

  AT can be used to assist people with disabilities to engage in a variety of recreational and leisure activities, such as sports, play activities, art, and social interaction. Dr. James A. Rimmer of the Department of Disability and Human Development at the University of Illinois, Chicago says, “Participation in play, recreation and sport has a profound impact on overall growth and development and are essential elements for a satisfying childhood and adolescence.” (2008)

The Americans with Disabilities Act (ADA) provides the accessibility guidelines for individuals with disabilities to access public parks, or recreational facilities. The regulations by the ADA allow people with disabilities to increase opportunities to access leisure and recreational activities in those places. In addition, a wide range of low-tech to high-tech AT can help people with disabilities to engage in the same activities as their non-disabled peers. Using AT may remove the barriers to involvement in recreation and leisure activities. This impacts them increate an individual's self-esteem, health benefits, and social interaction. It is noted that recreation and leisure activities are lifelong.

Examples of AT

AT for Game and Play

- Braille Boardgames
- Switch Adapted spinners
- Card Shufflers

Sports and Physical Education

- Sticky mitts and large bats
- All-terrain wheelchairs
- Adapted bikes, trikes and playground equipment

Arts and Crafts

- Stamps, cookie cutters and sponges as substitutes for paintbrushes
- Adapted scissors and utensil holders
- Switch operated paint spinners and pottery wheels
- Switch adapted digital camera

- **Learning, Education, and cognitive**

In educational setting, various types of AT can be used to reduce or remove the barriers to curriculum access for students with disabilities.

AT for Reading

Many students with disabilities do not access to the printed materials they need for several reasons, for examples, (a) students can not see the words or images on a page, (b) cannot hold a book or turn its pages, or (c) cannot decode the text or comprehend the sentence structure.

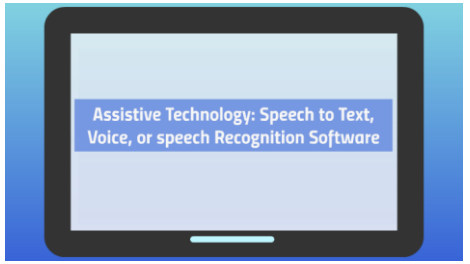
AT for reading can support individuals read text (books, textbooks, websites) in a varity of ways rather than reading traditional text.

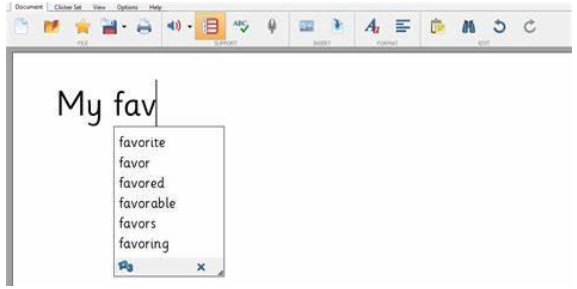
Examples of AT for Reading

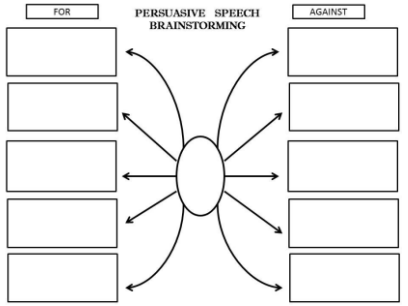
AT for Writing

Writing is a complex process that involves both the motor aspects of handwriting and the cognitive components of composing written materials. AT can support individuals who struggle with those different types of writing challenges. While some AT tools can make handwriting easier, other tools would help individuals who have trouble with spelling and grammar or expressing and organizing their thoughts into writing.

Examples of AT for Writing







AT for Organization

Many students with disabilities struggle plan, organize, and keep track of their schedules and assignments. AT can support those individuals having weak organization skills that help their self-monitoring techniques, visual organization, and time management.

Examples of AT for organization

- Digital highlighters and sticky notes
- Timer and reminder to perform a specific task
- Visual schedule
- Various reminder, timer, and scheduler apps
- Vibrating watch

1. Overview of AT Glossary

In relation to assistive technology, many terms and acronyms are being used. To help the learners to reference the list of AT Glossary, the Mada AT portal provides a wide range of AT and ICT Accessibility Glossary in Arabic and English to provide the reference of each term.

Mada Accessibility & AT Glossary Portal

2. Supplementary Materials for AT

Various websites will be reviewed to understand the AT devices and services based on the setting where the AT is needed such as for education, employment, and independent living.

Learning activities/ Instructional strategies

- Reading assignment – students are required to complete reading assignments before the module 3 session.

- Group Discussions – During the session, group discussions will be provided, and students are actively engaged in responding to the discussion topic. Based on the reading articles, students will provide feedback and reflections on each article.

- Class Lecture – Students are required to attend the online synchronous session(s) and actively participate in the lecture in response to various session activities.

- Exploring AT-related websites – students will explore various websites for their future reference to work on the AT implementation.

Resources and additional materials

Online content

- Center On Technology and Disability (CTD) - https://www.ctdinstitute.org/
- AT Glossary by CTD - https://www.ctdinstitute.org/sites/default/files/section/file_attachments/CTD-ATglossary-v4.pdf
- National Center on Accessible Educational Materials (AEM): https://aem.cast.org/
- Job Accommodation Network (JAN): https://askjan.org/
- Understood: https://www.understood.org/
- Call Scotland - Communication, Access, Literacy and Learning: https://www.callscotland.org.uk/home/
- QATI - https://qiat.org/

Resources and additional materials

Articles

- Ashton, T., Lee, Y., & Vega, L. A. (2005). Assistive technology: Perceived knowledge, attitudes, and challenges of AT use in special education. *Journal of Special Education Technology, 20* (2), 60-63.
- (PDF) Teachers' Knowledge and Use of Assistive Technology for Students with Special Educational Needs (researchgate.net)
- Bouck, E. (2106). A National Snapshot of Assistive Technology for Students with Disabilities. Journal of Special Education Technology, 31(1).
- Hemmingsson, H., Lidstrom, H., & Nygard, L. (2009). Use of assistive technology devices in mainstream schools: Students' perspective. *American Journal of Occupational Therapy, 63,* 463-472.
- (PDF) Use of Assistive Technology Devices in Mainstream Schools: Students' Perspective (researchgate.net)
- Sauer, A., Parks, A,, & Heyn, P. (2010) Assistive technology effects on the employment outcomes for people with cognitive disabilities: a systematic review. *Disability and Rehabilitation*

Resources and additional materials

Videos

Intro to AT from the Center on Technology and Disability: https://youtu.be/Z-1ZM4J2aSw

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