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Assisted Technology for Cognitive Comprehension in the Differently Abled

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Abstract:

This paper is a preliminary study on what Assisted Technology (AT) and Information and Communication Technology (ICT) are and the kinds of disabilities in learners. It examines what Assisted Technology Tools (ATT) / Softwares are and how they can help in cognitive comprehension in differently abled individuals/learners. It presents the types of Assistive Technology, its benefits and provides an overview of the opportunities offered by the internet and ICT (Information and Communication Technology) for the active and wholesome participation of persons with disabilities, in the learning process. Terms and keywords related to the topic have been explained in the course of the article. In addition, the paper provides a list of the Assisted Technology Tools, Softwares and Systems which give learners an opportunity to choose a relevant and user friendly tool. The new technologies highlight the benefit and opportunities that learners with disability can avail as other learners—turning yesterday's *disabled* students into today's *enabled* students.

Keywords:

Differently abled   ICT   Assisted Technology   Tools/Softwares   Cognitive comprehension

Introduction:

For a long time, differently-abled students were subjected to unequal and inadequate educational opportunities. However, in the recent past, the use of technology has opened up avenues for differently-abled learners who have struggled with academic tasks because of lack of appropriate infrastructure and accessibility or instructional problems.

The rapid development and application of computer-based technology, has opened up many available options for disabled students, ending the isolation and limited opportunities that disabled learners have long faced. Computer programs have been designed to make it convenient for disabled students to access material, communicate their ideas and work, and actively participate in educational experiences. For example, Braille reading and writing techniques have immensely benefited the blind or visually-impaired to continue their education with new Assistive Computer Technologies (ACT) that include mobility, hearing and visual aids.

KINDS OF DISABILITIES:

It is important to realize that there are different kinds of disabilities, and that new technologies have been developed to assist those who possess one or more of them. The most common disabilities, fall under these categories:

- **Cognitive**: Students with cognitive disabilities can be all over the map in terms of intelligence, but may suffer from difficulties with memory, self-expression, information processing, and other learning disabilities that prevent them from performing their academic tasks in the same manner as other students.

- **Sensory**: Sensory disabilities include visual impairment and blindness, deafness and hard-ofhearing conditions can prevent students from utilizing traditional classroom materials and tools.

- **Psychiatric**: These disabilities include a broad spectrum of challenges, from social phobias to bipolar or other personality disorders that make it difficult for them to maintain consistency in their academic work or personal life.

- **Physical**: Students with physical disabilities may require the use of braces, a cane or a wheelchair, may use prosthetic limbs, or may be dealing with muscular dystrophy, Lou Gehrig's disease, multiple sclerosis, or many other conditions, all of which can present accessibility challenges.

- **Health-related**: Students suffering from chronic conditions such as diabetes or epilepsy, or other diseases such as cancer often experience difficulty attending class regularly.

While each condition is different, and some learners deal with more than one, all learners with disabilities face numerous challenges in the traditional classroom environment. These challenges can include being unable to travel quickly from building to building for different classes in a

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school or on a college campus due to a physical disability, or difficulty using the same learning

formats as other students.

This paper focuses on cognitive disability, leading to cognitive comprehension by which we

mean the cognitive perspective of learning to read, reading comprehension (or, simply, reading)

and the ability to construct linguistic meaning from written representations of language.

INFORMATION COMMUNICATION TECHNOLOGY (ICT):

ICT refers to technologies that provide access to information through telecommunications. It

is similar to Information Technology (IT), but focuses primarily on communication technologies.

This includes the Internet, wireless networks, cell phones, and other communication mediums.

ICT allows for greater independence by enabling persons with disabilities to perform tasks that

they were formerly unable to accomplish, or had great difficulty accomplishing.

BENEFITS OF ICT:

Some of the claimed benefits of ICT for Education are:

- Easy-to-access Course Material–Multimedia/easy to understand course material can be posted

  on web which learners can access at a time and location they prefer.

- Motivation-Computer-based instruction can give instant feedback to students and explain correct answers. Moreover, a computer is patient and non-judgmental, which can give the student motivation to continue learning.

- Wide Participation -Learning material can be used for long distance learning and are accessible to a wider audience.

- Improved student writing -Convenient for students to edit their written work which can, in turn, improve the quality of their writing.

- Subjects made easier to learn -Many different types of educational software are designed and developed to help users to learn specific subjects/topics easily.

- More amenable structure to measure and improve outcomes. With proper structuring it can become easier to monitor and maintain student work while also quickly gauging modifications to the instruction necessary to enhance student learning.

ASSISTIVE TECHNOLOGY TOOL:

This term may be used to mean an assistive device, but more commonly denotes some kind of electronic or computerized device that helps a disabled person to function more easily in the world. Examples of assistive technology include devices that allow people to control a computer with the mouth, keyboards that can "speak" for mute individuals, and closed captioning systems that help the hearing impaired enjoy television shows and videos.

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Computers and Programs for Disabled Users:

A computer is an efficient and economical source of help for the disabled via the Internet, giving them a much-valued measure of independence. Individuals with disabilities have to experience a many barriers to computer use which can be grouped into three functional categories: i. Barriers to providing computer input,

ii.   Interpreting output, and

iii.   Reading supporting documentation.

To access output, computers for the deaf employ programs which replace sounds with written words and images. For blind users, programs like JAWS read any text out loud. Screenmagnification programs assist partially sighted computer users. To input data, tools like voice controls, Braille keyboards or pointers attached to the mouth, finger, head or knee aid disabled computer users. Attached printers can produce Braille documentation for blind users and largeprint copies for the visually impaired.

ASSISTIVE TECHNOLOGY SOFTWARES:

A variety of programs for disabled computer users help them to access the information they need to find and carry out work, learn, communicate and enjoy all kinds of entertainments. Finding and installing the relevant software may require the help of attendants and family members. A writing program called "Dasher" allows those who cannot type on a keyboard to use their eyes to

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write 25 words a minute. Its designers, David Ward and David MacKay of the Cavendish laboratory, used the tracking mechanism of a camera combined with logic from a video game to invent a program which learns a writer's style and predicts words based on that information. Dasher can also be combined with touchpad, mouse or roller ball. An American company, Blink Twice, developed a minicomputer called Tango for disabled children. Tango, which resembles a computer game, uses touch-screen technology to express a variety of prerecorded messages, activated by familiar icons, conveying moods and needs[4].

The following are some other Assistive Technology Systems and Softwares that can be used for cognitive comprehension by differently abled learners:

SOFTWARES FOR DIFFERENTIALLY ABLED CHILDREN:

1. *AbilityNet***:** A Software program for enabling children with a disability (in Northern Ireland) to access a computer.

2. *AVAZ***:** India's first portable speech synthesizer enables non-verbal persons to convey virtually any thought in their mind by providing them an 'artificial voice'. The principle of universal design is being followed by Inventions Labs so as to enable non-verbal persons with different kinds of disabilities to use the device. For example, the lack of motor control skills prevents persons with Cerebral Palsy, many of whom are non-verbal, from using traditional means of communication like writing or typing. AVAZ can easily be adapted for use by such persons

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with the help of commercially available access switches, many of which are compatible with the device.

3. *Literacy Software*: Literacy software solutions are also useful for those who have difficulties reading, writing and spelling or have Dyslexia. By harnessing the power of the inbuilt speech output facility, computer users can write, read, view and check text alongside a human sounding voice. High tech readers can be used by a visually impaired person to read any kind of printed material.

4. *BarrierBreak Technologies*: BarrierBreak Technologies has launched the *Signntalk* website **(www.signntalk.org)** in India, the first of its kind, to enable the hearing impaired community to communicate with the hearing world using sign language. Signntalk acts as a bridge to connect the hearing impaired with the hearing world.

A. Assistive Reading Systems

1. Text to Speech

As an assistive technology, text-to-speech (TTS) software is designed to help children who have difficulties reading standard print. Common print disabilities can include blindness, dyslexia or any type of visual impairment, learning disability or other physical condition that impedes the ability to read. However, other students can benefit from TTS technology, such as children that have autism, attention deficit hyperactivity disorder (ADHD) or an intellectual disability. The technology works by scanning and then reading the words to the student in a synthesized voice,

using a large number of speech sounds that make up words in any given context. With the advances in speech synthesis, TTS technology is more accurate and lifelike than ever.

2. Intel Reader

The Intel Reader is a mobile handheld device that uses TTS technology to read printed text aloud. It features a high-resolution camera that captures printed text, converts it to digital text and reads it to the user. During playback, words are highlighted as they are read aloud, and the user can pause and have the device spell out highlighted words. The available Intel Portable Capture Station functions as a stand for the Intel Reader to easily and quickly capture text from books and other documents. At about the size and weight of a paperback book, the Intel Reader is mobile enough to use in any environment. Students can also transfer content from a home computer, or save generated audio versions of printed materials to a computer. Available voices vary in gender, pitch and speed.

3. Kurzweil 3000

The Kurzweil 3000 is a leader in TTS software for individuals that struggle with literacy. In addition to a range of TTS features, the full-featured software program integrates abilities that can help students in other areas, potentially appealing to those who may have a non-print disability or those who may not typically consider a TTS program. Some of the features include:

• Multiple TTS voices

• Support for 18 languages and dialects

• Talking spell-checker

• Picture dictionary graphics for more than 40,000 words

• Text magnification

• Tools for test taking, essay writing, note taking, reference and more

The Kurzweil 3000 strives to provide students with a multi-sensory approach to literacy learning.

It is available for Windows and Macintosh.

4. Graphic Organizers

Graphic organizers can be effective in helping students organize their thoughts during the writing

process. As an assistive technology, graphic organizers can be a strong choice for students with

dysgraphia or disorders of written expressions, particularly the conceptual aspects of writing.

Graphic organizers work by helping the student map out a course of action. Depending on the

type of writing, the graphic organizer can prompt the writer to describe an object, chart out a

course of events or perform some other task that can help in planning the piece. Graphic

organizers vary by type and technological sophistication.

Low-Tech Handouts:

Graphic organizers do not need to be technologically advanced; in fact, they can exist in

simple handout form. The sandwich chart can assist students with paragraph writing. The

sequence chart can help with narrative writing and the ordering of events. The sense chart is

designed for descriptive writing, where writers are prompted for terms that characterize and

express an item. Dozens of other sample charts exist and can help students with virtually any type of writing.

5. *Draft Builder*:

Draft Builder is a writing tool that integrates outlining, note taking and draft writing functions to break down the writing process into three steps. Using a graphical organizer, the program helps the student visualize the project and insert information into the appropriate place without having to conceptualize the whole process. It then automates the process of creating the paper, where the student can drag and drop what is written in each note to the rough draft. Other features include a talking spell checker that uses TTS technology, a bibliography tool, a dictionary and the ability for teachers to add locked text into the program for further guidance. Draft Builder is available for Windows and Macintosh.

B. Assistive Listening Systems:

A variety of assistive listening systems, or hearing assistive technology, can help students who are deaf or hard of hearing, as well as those with other auditory and learning problems. According to the National Association for the Deaf, assistive listening systems can be used to enhance the reach and effectiveness of hearing aids and cochlear implants, or by children who do not need those tools but still need help hearing. Assistive listening systems use a microphone, a type of transmission technology and a device for capturing and bringing the sound to the ear. The specific

transmission technology used in the system is typically what contrasts one type of assistive listening system from another.

1. *FM Systems***:**

These systems are the best choice for children with sensorineural hearing loss. The most common type of hearing loss for all ages, sensorineural hearing loss occurs when the inner ear (cochlea) or nerve pathways from the inner ear to the brain are damaged. FM systems work using radio broadcast technology. With a transmitter microphone and a receiver, the teacher and student can maintain a consistent sound level regardless of distance and background noise. Additionally, ASHA notes that the hearing aid microphone can be turned off, so the student can concentrate on the teacher alone.

2. *Sound-Field Systems***:**

Sound-field systems are a strong choice for classrooms that need to assist listening for all children in the class. These systems benefit not only children that have hearing loss, but those that have other auditory and learning problems, such as language delays, central auditory processing disorder, articulation disorders and development delays. Additionally, sound-field systems can be used for students who are learning English as a second language. Sound-field systems use a microphone that projects sound through mounted speakers around the classroom.

In classrooms that have good acoustics, sound is able to travel evenly throughout space, eliminating problems of distance between the speaker and each listener.

C. Proofreading Software:

Proofreading software is a branch of assistive technology that goes above and beyond the typical proofreading features found in a word processing system, such as correcting words frequently misspelled by students with dyslexia. A number of other features offered within this category can help students work on his or her English skill set to become a more effective and accurate writer. Although primarily geared towards individuals with dyslexia, proofreading software can be helpful to those with any type of learning disorder that makes writing and reading challenging.

1. Ginger

Ginger offers several features that can help students with dyslexia and other learning disorders with writing. It is also designed for speakers of languages other than English. Some of the features include:

• Grammar checker that analyzes context to determine any errors or misspellings. For instance, Ginger can recognize whether "there," "their" or "they're" should be used in a sentence, which is a common mistake in writing.

• Word prediction and sentence rephrasing tools that can be helpful for students learning how to construct sentences properly.

• TTS functionality so students can hear what they've written.

• A personal trainer that provides practice sessions based on past mistakes made by the student.

Ginger is available for Windows and Macintosh systems, as well as for use on iOS and Android mobile devices.

2. Ghoti

Ghoti is specifically designed for students with dyslexia and other learning disorders who have difficulties with writing. The name is inspired by the word "Ghoti," which is a constructed term that illustrates irregularities in the English language. And since many spellings are counterintuitive — especially for those with dyslexia-Ghoti dedicates itself to assisting children and adults who struggle with writing accurately.

It features the ability to learn from the user's past mistakes, personalizing suggestions for spelling and grammatical errors. Ghoti can predict words, check passages of text contextually, read text aloud using TTS technology and recognize split and merged words. It also includes an integrated dictionary for students to quickly look up a word.

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CONCLUSION

Augmentative communication systems help students with speech problems to overcome the communication barrier. Such systems use picture charts, books, and specialized computers providing functions of word-prediction for more effective communication. Last but not the least, application of technologies for special education must consider the following issues:

- Cost of a given solution and its potential effect on the learning process.

- Preference for a technology that is not difficult to master.

- Ensuring that the application chosen is reliable and will naturally integrate into the educational process.

- Focus on user-friendly and intuitive solutions.

- Possibility to implement custom functionality that meets requirements or customize the existing solution.

One tool to help students with disabilities even in the face of a special education teacher shortage is assistive technology. Today, assistive technology can help students with certain disabilities learn more effectively. Ranging in sophistication from "low" technologies such as a graphic organizer worksheet to "high" technologies including cutting-edge software and Smartphone Apps, assistive technology is a growing and dynamic field. Several areas of assistive technology and sample products may be found in any given classroom, making a difference in how students of all abilities learn. For further study, activities using ATT, relevant to the language learning process in the classroom for differently abled can be considered.

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