EasyChair Preprint

№ 2354

Assistive Technology for Students With Visual Impairments: A Resource for Teachers, Parents, and Students

Amit Sadh

January 10, 2020

Assistive Technology for Students With Visual Impairments: A Resource for Teachers, Parents, and Students

Amit Sadh
Senior Special Teacher (VI)
Department of Secondary Education Rajasthan (India)

Abstract

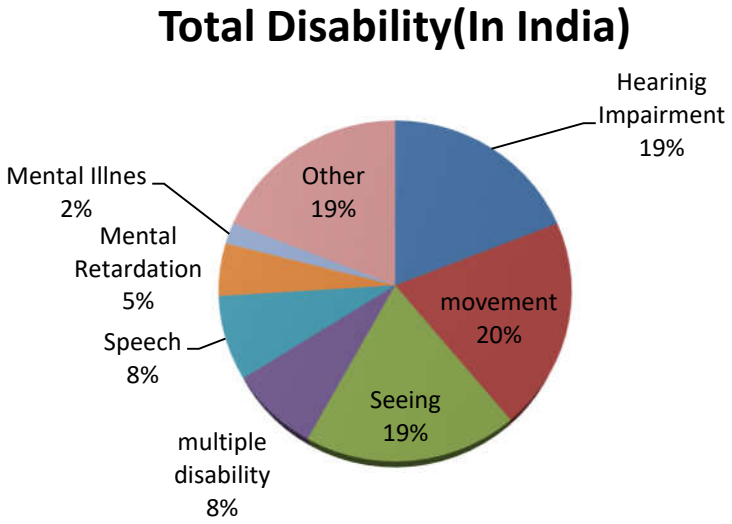
Today is era of technology. We see everywhere technology. Technology is the skills, methods, and processes used to achieve goals. In this manner, there are special types of technology tools that can help people who learn understand and working differently? These specific tools are known as Assistive Technology (AT). Actually AT is any software, device or equipment who helps people with disability work around there disability help to make easier there life. Like in regard to Visual impairment Braille watch is AT who helps Visual Impaired person to know time. So we can say that AT is one of essential part of visually impaired child academic or whole life. At allows VI to use their skills and engaged in school environment and use these technologies without helping other. The Rights of Person With Disability Act, 2016 (RPWD) mandate for Assistive Technology is one of crucial part of visual impaired student. There are several research found that use of technology(AT) is lesser in rural area as compare to urban area in India. The scope of AT is fully determined the knowledge of teachers and their knowledge of technology.
The main theme of this paper is to potency of AT for visual impaired person. Here in scenario some of special provisions have been also discuss in this paper. It's focus on various types of technology and their use in life if visually impaired child.

Keywords: AT, schools, technology, Braille ,visual impairments, disability, PWD(Person with disability), Visual Impairment(VI)

Introduction:

As per census 2011 main data is as following

1. Total population:121 Cr
2. 2.68 Cr disable (2.21% of population)
3. In total , rural area 69% and 31% In Urban area
   (disability static in India is as following in diagram)



There are 5033431 visually impaired in India which is world largest disability population. Approximately 285 million people are visually impaired worldwide of which thirty nine million are visually impaired and 246 have Low-Vision, according to WHO statistics.

Visual Impairment (As per RPWD 2016) (a)

Blindness : blindness" means a condition where a person has any of the following conditions, after best correction—

(*i*) total absence of sight; or

(*ii*) visual acuity less than 3/60 or less than 10/200 (Snellen) in the better eye with best possible correction; or

(*iii*) limitation of the field of vision subtending an angle of less than 10 degree.

National Policy for Persons with Disabilities-(2006)

This policy implies that person with disability are important assets for India and society and also seeks to create a healthy environment that provides inclusion-opportunities-freedom and fully inclusion in society.

The focus of this policy is

1. Disabilities Prevention
2. Rehabilitation Measures
3. Woman and Children with disabilities –
4. Barrier-free environment
5. Issue of Disability Certificates
6. Social Security
7. Promotion of Non-Governmental Organizations (NGOs)
8. Collection of regular information on Persons with Disabilities –
9. Research, Sports, Recreation and Cultural life
10. Development of assistive technology
11. Free education

Use of Assistive Technologies:

Children with VI (CVI) may attend a mainstream school with a resource base. This arrangement also gives the advantage of pupils being socially integrated in an ordinary school community. Collectively, CVI attending a resources base may not feel so isolated or special. In school with a resource unit technology, the extra support that pupils receive whilst in mainstream class group may not be very different from that which might be provided in any school. Normally in all educational institute all student come with a number of queries. So that special child also come there (schools/ special institute) for finding solution of their problems. Like how technology will enhance their working capabilities and solve their barrier? And what sort of technology is helps for getting education like other? Such types of queries are differing from man to man and as per disability and needs. Like visual perception things are not important for visually impaired child as compare to hearing impaired child and audio device is not useful for hard of hearing person but visually impaired person like it most. So we can say that teacher and manufacturer have proper knowledge that what sort of special requirements of these person. Person with special-needs according to their needs require some conceptual-structural changes in technology like add or remove tools in the conventional technology for more accessibility.

Any things or technology which is enhancing working capacity or ability is known as Assistive Technology. In other word we can say that AT means any adaptive device or service product equipment that increases independence, achievement participation, learning capacity of person with disability. AT enables people to live confident lives, and to involve in civic life., the labor market and civic life. AT helps person with disability to live healthy independent and dignified lives and civic life. AT help person with disabilities to actively participate in academic life like read-write etc. In wide context, AT is useful for creating new abilities for person with special needs including physical, intellectual, cognitive, learning and sensory disability. AT helps students with visual impairment use these in their educational institute like complete assignment, examination and other curriculum and co-curriculum activity. There are a lots of assistive technology like Braille Embosser ,Braille display, audio devices ,touch control device, CCTV, speech synthesizer ,smart phone etc. AT's are highly imperative for helping VI student to achieve own goals and aims in life and getting success. AT also helps visual impaired child for social interaction with sighted and other person.

Special Technologies and Devices:

Classify visual acuity of any person is very tough work. Most of visual impaired students need some special types of special technology for getting productive and effective learning during their studies. Low vision students require large font materials, low vision device like magnifiers lenses CCTV and other technology for good approach. The students with VI who normally using on recording tape material or Braille printed books, these days with using technology having many option of a lots of devices and technology which make them confidents and independent like using simply reading application in mobile. These devices are very useful for visual impaired student and low vision. In the

area of computer technology or innovation of speech synthesizer is also perform a crucial part in academy life of VI students.

Auditory-Based Technologies:

Auditory based technology are helpful for visually impaired child like recording lesson or book by using tape recording for later use or review. Most auditory AT for visual impaired students employs synthetic speech. These include talking computer interfaces, reading machine Use of software like NVDA which convert text to voice, and talking calculator, voice recognition computer. For reading purpose, the use of pre recorded study material and speech recognition may crucial importance to save energy effort and time of visually impaired student. There still are no AT that use both 3D sound and signification to augment the auditory environment for visually impaired student.

Braille Watch:

Braille watch is also another part of dot watch which is designed for visually impaired person. Both are same, Actually Braille watch is portable hand wear technology that is used by visually impaired child for knowing time. It process is very simple, by touch dial pad and noticing the embossment of Braille dot or arrangement of dialer. There are both digital and analog versions are available. The analog watch have protective by a crystal or glass cover that is easily open when want to needs time. Dialer are tight, so during embossment no movement in dialer. In digital form, the Braille dot changing position as time change. As we know that visually impaired student using Braille script, so in digital watch they easily read time in watch.

Talking clock:

Talking clock is a device that presents the time in form of sound. It is a recorded or live human voice services usually accessed by telephone that gives correct time to user or visually impaired person. The first speaking clock was

introduced in France on February 14, 1933. It may present time merely as sound like as a telephone based time service

or clock for visually impaired person

Optical Character Recognition (OCR):

OCR system provide person who are visually impaired with ability to scan printed text or font and then convert into audio format. The key element is OCR is scanning, recognition and reading text. Now there are very advancement in OCR technology. So that current time OCR technology provides fine accuracy and amazing formatting capabilities like OrCam MyEye. The OrCam is an OCR device that takes a picture of texts and relays the message to the user via a mini earpiece. Actually OCR helps visually impaired students to scan and read printed material and convert into synthetic or digital speech. Using this technology visually impaired student education is become easier.

Braille Scanning Software:

OBR (Optical Braille Recognition) is Window based software that gives facility to user to read Braille document on standard scanner either in single or both sided document. Its process is very simple i.e

1. Analyzes the Braille dot
2. Translate into normal text
3. Then show in computer screen.

Audio devices:

Mostly VI student prefer to use audio material in studies along with Braille. Visually impaired student normally use recording material like cassette and recording machine for a lots of purpose, like records their books, notes and other study materials. To feel easy to submit their assignment into audio format as compare to Braille format. There are a lots of audio format books, software are available in online market like simply reading application, DAISY player etc. Talking books are available in different format which run on prior or sophisticated audio devices.

Now a day's DAISY (Digital accessible information system) player plays a great role in education of VI child due to audio advancement of its technology. The DAISY is technical standard for periodicals computerized and digital audio book it world leading technology for digital audio talking books specially design for visually impaired person. There are three types of DAISY books i.e. as following:

1. Audio-only DAISY, is the very usual technology. Its framework provides low data and a recorded data that the user listens when the book is played.
2. Text-only DAISY is different from Audio-only because there are replacements of audio by text of books itself. It is using with the help of Braille-Display or TTS (text-to-speech). Bookshare.org is creating these Daisy-books (text only).
3. The Cadillac in DAISY books is found in the full-text-audio DAISY book. This types of Daisy data provide both audio and text facility with synchronization. With the help of this advance technology user can easily hear TTS voice at

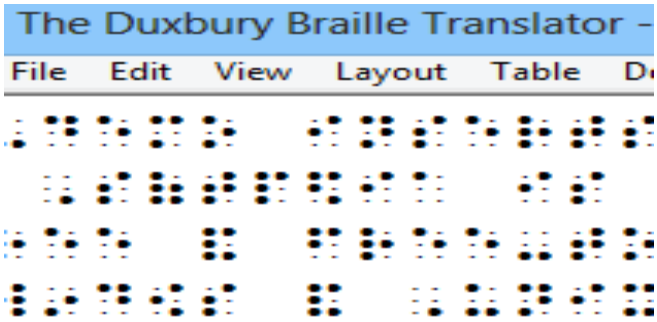
will to judge grammatically information like spelling etc. These types of books also run on player which directly not support only text format. Also other many advance features are involve in this Daisy player.

.

Daisy Player

Braille translators:

Braille displays and translators especially designed for visually impaired person who normally use Braille method. Reading writing Braille with this technology is very simple method. It's very simple process to reading-writing Braille using this software technology. Now a days, the famous or generally technology have furnished with Braille display.



Braille embosser:

It is a special printer that transferor text-data as Braille or we can say that it is a device that can generate printed material using the Braille writing system for visually impaired person. By the use of specially designed software for translation Braille script, a Braille document can be convert very easily, making Braille printing approachable and proficient. Now a day's thousand of reading materials of different area and language of the world are embossed in Braille. With this, printed materials are easily available for visually impaired in very cheaper rate. Today there lots of types Braille embosser are easily available in market and use for producing magazines-books for visually impaired. Operating these technologies is very easy. So that it is widely use technology in the field of visually impaired person education.

Mini desktop embosser are usual or and can be establish in space or place for visually impaired person like university, libraries and special person centre, as well as being personally owned by visual impaired. Belgian-made NV Interposing 55 is the fastest industrial Braille embosser is, its output up to 800 Braille characters/second.

Screen Reader:

Screen reader is application software which helps visually impaired person to use computer without help of sighted person. We can say that it is interface between Operating System, its running application and visually impaired person. Screen readers work closely with the Operating System to provide information about menus, icons, folders files etc. There are two ways that this hardware can provide feedback to the user i.e. speech and Braille. Screen reader software uses Text-To-Speech engine to translate on-screen data into speech which is heard by earphone, headphone or speakers. There are several types screen reader software using in different area of world. In which some are as following:

- NVDA
- Jaws(Job Access With Speech)
- Voice over(ios)
- Zoomtext fusion

Braille displays:

It is an electro-mechanical device for showing Braille script sentences-characters. Actually it is tactile device that consists a row of special cells which are soft. It normally attached with keyboard which allows visually impaired to read data of display a single line at a single moment Braille script. When keyboard and Braille display both are connected that time Braille displays make it possible for visually impaired child to use computer read the display and browsing internet like sending receiving email. Visually impaired users who cannot use monitor can easily use it to read text output. Deaf blind also this technology very effectively after proper training.

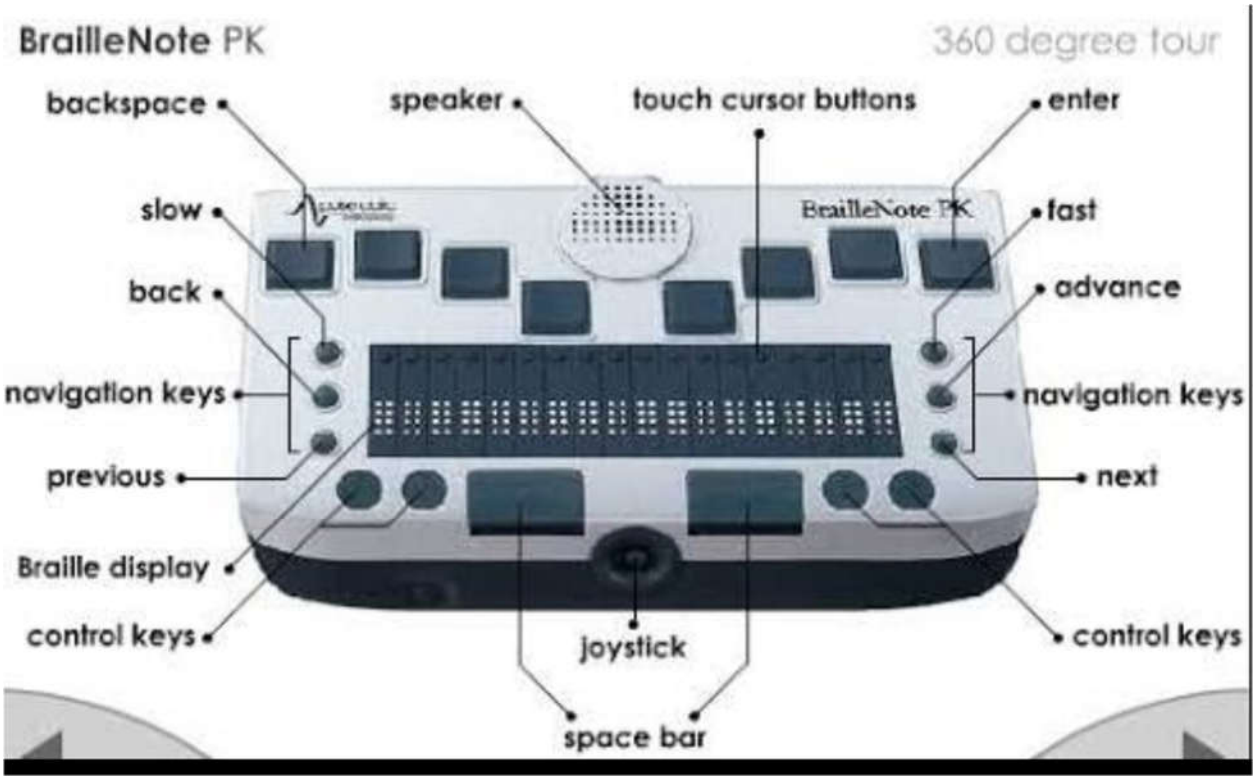
Diagram**. A visually impaired woman uses a laptop and a Braille display.**

Google Talkback :

Google talkback is an accessibility service for android user that help visually impaired person to interact with mobile. It also use Text-To-Speech engine. Talkback have a lots of features like spoken word, vibration and other audio feedback f or user to know what's going on screen and help user to interact with screen. Actually this time its most frequently usable technology used by visually impaired person.

Braille Note-takers:

It is mini portable AT device especially made for visually impaired person. Braille note-takers are used to take notes in Braille script. This device storing device with use of Braille typewriter keyboard. The stored information is accessed by or Braille display or default speech synthesizer. An old note taker takes lots of times to make education materials like notes. So resultant of this is that visually impaired student could not take entire notes of session or class. But now a day's it's not happen. Because technology ofBraille note-takes is become easy and fast. Braille note takers are helping to make note in faster way for visually impaired. The latest note takes device provides advance web browsing, word processing, sending message and other function.



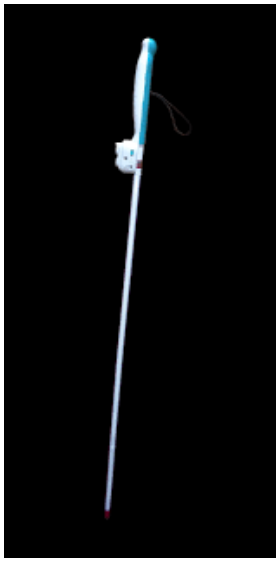
Talking Calculator :

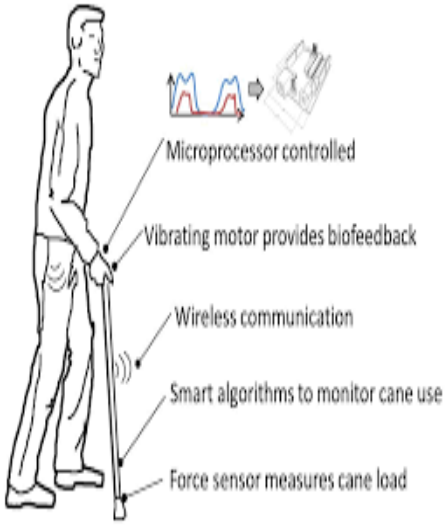
A talking calculator has a built-in speech synthesizer that spoken loud on each operation like press number, symbol etc. Talking calculators function is like common calculators. This device is mostly used for visually impaired person. This can help the user to verify the operands have enters correctly. It also speaks answer after finishing operation. There are lots of variant are available in market. A common feature is enlarging number so that low vision person can also use this easily. This AT is available in market at cheaper price. The additional features also added in talking computer like alarm and music also reminder. Sometime extra large number input button are also very useful for visually impaired child

Smart Cane

Smart cane is advance cane used by visually impaired person for independent safety mobility or we can say that smart cane is useful for visually impaired child for smart mobility. Normally smart cane is white with folding variant. We can say that it is transformation of white cane which is frequently used by visually impaired person. White cane cannot detect overhanging object like open glass window, bunches of trees or sign board. Then the need for smart stick was felt.

These can solve many challenges and provide and guaranteed visually impaired though safe mobility or independent. Visually impaired person can easily detect ground barrier, surface structure etc. during his journey. This is not possible in using white cane because white cane scratch a parking vehicle, impinge into other person.



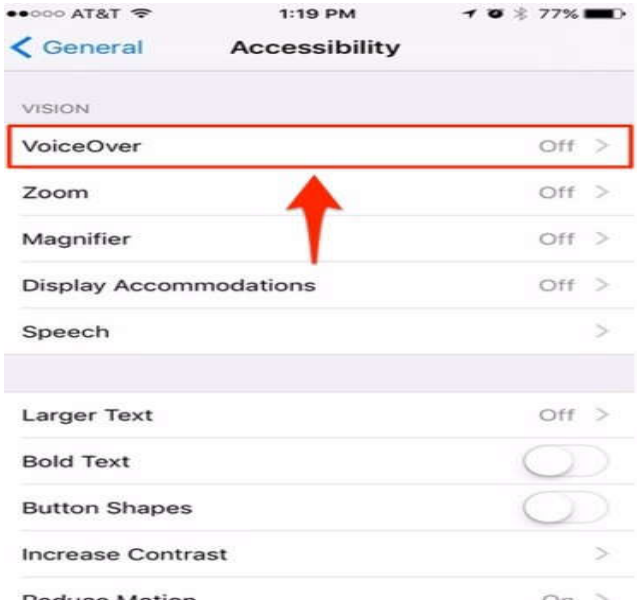


Smart Phone:

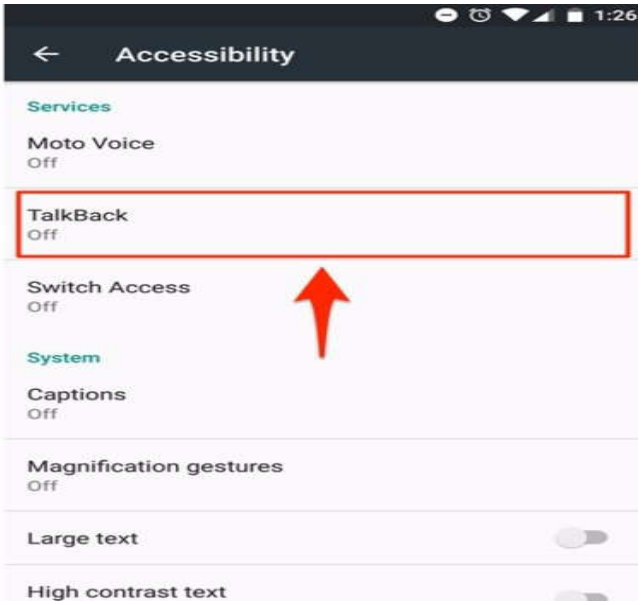
When a sighted person uses a touch screen Smartphone or tablet, he or she taps icons or slides a finger across the Today era smart phone is not a unfamiliar term. Smart phone is become most important part of our life. During using smart phone user taps icons or slide finger across the display in order make any event on screen. Now a days a famous or we can say that three top marketplaces companies i.e. Apple, Google and Microsoft. Each includes both a screen magnifiers and a screen reader in their OS or devices.

Edit fields are areas that require the entry of information (such as the phone number you'd like to dial or the text of an e-mail you'd like to send). When you double-tap an edit field, the devices onscreen keyboard appears. Most touch screen devices offer at least two ways to type.

- Standard typing: This is usually the default typing mode. Touch the screen until you find the character you wish to enter, or swipe your finger and listen as the new character is announced. When you find the key you want, perform a double tap. It's that simple.
- Touch typing: As you become familiar with the onscreen keyboard, you may wish to speed up your text and number entry. Touch typing mode allows you to find the key you want to enter by either touching the screen or sliding a finger across the onscreen keyboard until your device announces the character you want. At that point simply lift your finger off the screen to enter and voice the character. Then you can return your finger to the screen to locate the next desired character, digit, or punctuation mark.



Apple's VoiceOver,



Android's TalkBack

Conclusion:

Visually impaired person needs are greater than ever before. AT will continues change the life's of visually impaired person as compare to previously decades. The increase of advance computing, mobile technologies or other many electronics devices are expected to drive field further towards the challenges and reality of creating usable AT. Actually visually impaired person always struggle for education in periodic field episodic to their disability. As technology progress day by day resource for visually impaired person also increase very much. Today we can't imagine education of visually impaired student without using Assistive Technology. There are many online courses and websites are available and specially designed for visually impaired person. Although educational bodies like school, college and universities have been not as active to provide and ensure accessibility of learning materials and environment of this special person. If using AT in study, their effect will also show in education of student either it implement on normal child or special child. These technologies consists a variety of new things which consists a lots of types devices hardware and software application which allow student who are visually impaired to get knowledge without any barrier.

References:

https://en.wikipedia.org/wiki/Google_TalkBack

1.SIEKIERSKA, E; RICHARD , L; LOUIS B; BILL, M; PETER, P:Enhancing spatial learning and mobility training of visually impaired people—a technical paper on the Internet-based tactile and audio-tactile mapping
2.An insight into assistive technology for the visually impaired and blind
people: state-of-the-art and future trends :Article in Journal on Multimodal User Interfaces · January 2017

3.Rout Sharada ,P 1: Persons with Visual Impairments and their Educational Needs in India: Use of Special Devices and Assistive Technologies
4.https://en.wikipedia.org/wiki/Talking_clock
5.https://www.brighthubeducation.com/special-ed-visual-impairments/74539-assistive-technology-for-students-with-visual-impairments/
6.https://en.wikipedia.org/wiki/Braille_watch
7.https://slideplayer.com/slide/3540597/
8.https://www.insider.com/how-blind-people-use-smartphones-2017-2
9.https://www.afb.org/blindness-and-low-vision/using-technology/cell-phones-tablets-mobile/touchscreen-smartphone
10.Webster, ALEC; Roe, J : Children with Visual Impairment

11.Census of India (2001) General Population Tables.
Niemann, S; Jacod, N: Helping children who are blind