IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

6th National Conference on Science, Technology and Communication Skills – NCSTCS 2K23

Narula Institute of Technology, Agarpara, Kolkata, India

Vol. 10, Special Issue 3, September 2023

Assistive Technology for the Inclusion of Students with Disability

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Abstract: The practice of making opportunities exclusive and providing equal resources to people who might otherwise be excluded, like those having disabilities concerning their physical health or intellect or belonging to other minorities, is termed as inclusivity. Inclusivity of students in all familiar settings is required but mostly necessary in all educational institutions which will prove to be beneficial for not only those students but for all students, as it will help them grow more accepting and mindful as individuals. The ultimate goal is to fabricate classrooms having the least restrictive environment to meet the needs of all students. It allows them to grow independently, get sustained social interactions, and help them overcome their limitations. Assistive Technology comes into play right here to bridge the gap between the vision and possibility of a comprehensive teaching space. The phrase 'Assistive Technology' is really an umbrella term, which, according to the Assistive Technology Act of 1998, in the U.S. is defined as "any item, piece of equipment or system, whether acquired commercially, modified, or customized, that is commonly used to increase, maintain, or improve the functional capabilities of people with disabilities". The main idea is to build a software application that can be installed in tablets and made available in classrooms, with the control handed over to the class teacher. The basic framework of the application will be to assist students with vision, speech, or hearing disabilities. An AI text-to-speech technology will be generated which will scan printed words as well as handwriting and read it out aloud for the student to understand; similarly, it will also include a text-to-speech function, which entails typing the sentences and then getting to play them out loud. Bluetooth device connected to the tablet and working alongside cochlear implants will generate audio in a loud volume cancelling all the background noise. Working in real-time will amplify the teacher's voice to have the students hear clearly. The real-time speech-to-text feature which will convert audio into typed sentences will be displayed on the screen. High-contrasted fonts and visual timers for students with an intellectual disability like autism or ADHD. Apart from building this software, it is necessary to equip the classrooms with crutches, wheelchairs, and straws for drinking.

Keywords: Assistive technology, Inclusivity, Disabilities, AI-integrated software

I. INTRODUCTION

In today's rapidly evolving educational landscape, the focus on inclusivity has become paramount. As educators strive to create learning environments comprehensive, that accommodate students with diverse needs, assistive technology has emerged as a powerful tool. Assistive technology encompasses a wide range of devices and technologies designed to support individuals with disabilities, empowering them to access education on an equal footing with their peers. The idea of inclusive education presents itself with the possibility of the much-required share of equality in approach for the education of students with disabilities by providing them with a levelled field to demonstrate their diverse skills and practice together on an equal footing. This article explores the significance of building a software application immersive with assistive technology in promoting inclusivity, along with a selection of devices tailored to address specific disabilities.

II. SCOPE OF ASSISTIVE TECHNOLOGY

Assistive technology refers to a broad range of tools, devices, software, and equipment that are designed to assist individuals with disabilities in performing tasks, enhancing their learning experiences, and promoting independence. These technologies can encompass various forms, such as augmentative and alternative communication devices, mobility aids, screen readers, speech recognition software, and adaptive learning platforms. Assistive technology aims to eliminate or mitigate barriers faced by students with disabilities, enabling them to access educational materials, participate in classroom activities, and achieve academic success.

III. THE SOFTWARE APPLICATION

Building a software application that is immersive in assistive technology can greatly aid students with disabilities in their educational journey. Such an application can provide a comprehensive platform that integrates various assistive technologies, features, and resources to cater to the diverse needs of students. The main goal is to build a software application that will be installed on tablets as well as computers and made available in classrooms. With the control handed over to the teacher, the basic framework of the application will be to assist students with vision, hearing, speech or intellectual disabilities.

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This article explores the significance of assistive technology in promoting inclusivity, along with a selection of devices and technologies tailored to address specific disabilities.

Visual Impairment: For Impairments concerning one's vision, an AI text-to-speech technology will be generated in the tablet, this feature will let the user scan texts which are printed on a textbook as well as handwritten text, then read it out aloud for the student to understand. Optical character recognition (OCR) technology facilitates the conversion of printed text into digital formats, making it accessible through screen readers Traditional textbooks to be made available in the Braille language is also encouraged. There will also be audiobooks made available in the application itself and screen readers will also be implemented. Additionally, electronic magnifiers and speech-to-text software to assist students with low vision. Apart from this, it is encouraged to include projectors and interactive whiteboards which will aid in presenting information. It is also necessary to include traditional textbooks that do not have any audiobook format to be made available in braille language for further assistance.

Hearing Impairment: Assistive technology plays a vital role in ensuring students with hearing impairments can actively participate in the educational process. The AT (assistive technology) application will have a feature that will be connected to a Bluetooth device that will work alongside cochlear implants and generate audio in loud volume cancelling all the background noise. This will also work in real-time, amplifying the sound of the teacher speaking in the class. It will also have a real-time speech-to-text feature which will generate typed sentences on the screen as the teacher is speaking in the class. An alarming light system will also be added in the application, with the tablet screen lighting up in in any case of an emergency, this will entail an alert, manually sent by the teacher to alert the student.

Speech Impairment: Similar to the speech-to-text function, the application will also offer text to speech feature, which ensures that the student will have the option to type out sentences and the application will then voice them out aloud through the speakers of the device being used. Pre-generated regularly used words, phrases, or expressions will also be present that the student can choose to play out loud.

Intellectual Disabilities: Students with learning disabilities benefit from assistive technology that caters to their individual needs. Text-to-speech software converts written text into spoken words, aiding comprehension and information processing. Voice recognition feature allows students to dictate their responses, reducing the challenges of writing. A high-contrast text-to-speech feature that will assist students who face problems in reading. The high-contrast lettering will help the child in deciphering and differentiating every letter from the another. There will be pre-generated math worksheets on the application itself, apart from this, it will also include highly contrasted fonts in calculators and visual timers that can help with calculations. Other than this, it is advised to have Graphic organizers in classrooms that can assist with organizing thoughts and ideas. Mind mapping and organizational software assist with structuring and organizing ideas, promoting effective note-taking and planning skills.

Mobility Disabilities: Assistive technology empowers students with physical disabilities to engage fully in the learning process. Alternative input devices such as specialized keyboards, switches, and joysticks accommodate students with limited mobility. There will be developed a navigation system in the application itself to guide wirelessly connected wheelchairs that will not require manual pushing of the machine. Building inclined planes and elevators to assist in their regular transport is also necessary. It is also advised to equip the classroom with crutches and canes for further assistance of the students, and also keep present straws, for the ease of drinking.

IV. FEATURES OF ASSISTIVE TECHNOLOGY SOFTWARE APPLICATION

Some key considerations and features in the outline to include when developing an immersive assistive technology software application:

Accessibility and customization: Ensuring that the application is designed with accessibility in mind, obeying to universal design principles, implementing features such as adjustable font sizes, high contrast modes, and keyboard navigation options to accommodate students with visual impairments or motor disabilities. Additionally, providing customization options that allow students to personalize the interface, fonts, colour schemes, and preferences based on their specific needs and preferences.

Multiple sensory systems for content display: Integrating multiple modalities for content delivery to cater to different learning styles and disabilities. Including text-to-speech capabilities to assist students with reading difficulties or visual impairments. Providing support for captions, sign language videos, and transcripts for students with hearing impairments. Considering the inclusion of visual cues, interactive elements, and multimedia content to enhance engagement and understanding.

Augmentative and alternative communication (AAC) support: Integrating AAC features into the application to assist students with communication challenges. Including symbol-based communication boards, predictive text, and voice output options to facilitate effective communication. Implementing features that support both verbal and non-verbal communication, ensuring that students with speech impairments have the means to express themselves and actively participate in classroom interactions.

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V. THE CURRENT LANDSCAPE OF ASSISTIVE TECHNOLOGY

Overview of assistive technology adoption in educational institutions: The adoption of assistive technology in educational institutions has grown steadily over the years, but challenges persist. While some schools have successfully implemented assistive technology into their classrooms, others still face barriers such as limited funding, lack of training for educators, and inadequate infrastructure. To ensure widespread adoption, it is crucial to address these challenges through targeted investments, professional development opportunities, and infrastructure improvements.

Trends and advancements in assistive technology: Rapid advancements in technology have expanded the possibilities for assistive technology. The emergence of artificial intelligence, machine learning, and natural language processing has enabled more sophisticated assistive tools. For example, speech recognition software with language models trained on vast datasets can now provide more accurate transcriptions and support for students with speech or hearing impairments. The integration of virtual reality and augmented reality technologies has also opened up new avenues for immersive learning experiences.

VI. BENEFITS OF ASSISTIVE TECHNOLOGY FOR INCLUSIVE EDUCATION

Improved access to educational materials and resources: For students with disabilities, assistive technology lowers barriers to accessing educational materials. Students with visual impairments can access written text via electronic textbooks, screen readers, and optical character recognition technologies. Students with hearing problems can access audio content through captioning and transcribing services. Assistive technology guarantees that all students can effectively engage with instructional materials by providing multiple modes of information distribution.

Enhanced communication and participation: For students with disabilities, assistive technology promotes efficient communication and active engagement. Students with speech difficulties are given the opportunity to express themselves and participate in class discussions thanks to augmentative and alternative communication (AAC) tools. Students with hearing impairments can communicate more easily because to real-time captioning, sign language interpreters, and assistive listening technologies. These tools encourage teachers and students to interact in inclusive and relevant ways. Assistive technology also provides collaborative platforms and tools that let kids work with their peers and teachers in addition to AAC devices and communication assistance. Students can offer their thoughts, ask questions, and participate in collaborative projects through online discussion forums, video conferencing, and platforms for shared documents. By facilitating effective communication, assistive technology promotes a sense of belonging and active engagement in the learning process.

Increased sense of independence and self-confidence: By enabling students with disabilities to become more independent learners, assistive technology helps these students feel more confident and deserving of respect. For instance, students with physical disabilities are able to move around the school on their own with the help of mobility aids like wheelchairs and assistive navigation systems. Students with learning disabilities can overcome difficulties in reading and writing with the aid of text-to-speech and speech recognition software, giving them more autonomy in completing assignments and assessments. Assistive technology encourages a sense of empowerment in students by minimizing their reliance on others and advances their general well-being.

VII. CHALLENGES IN IMPLEMENTING ASSISTIVE TECHNOLOGY:

Financial constraints and resource allocation: The cost of purchasing and maintaining the required hardware, software licenses, and training is one of the major obstacles to implementing assistive technology. Budget restrictions frequently affect educational institutions, making it challenging to give all students who need assistive technology fair access. To guarantee that assistive technology is accessible to those who require it, adequate resource allocation and strategic planning are required.

Training and professional development for educators: Lack of thorough training and professional development opportunities for educators regarding assistive technology is another important issue. To effectively incorporate assistive technology into their instructional practices, meet the needs of a variety of students, and troubleshoot potential technical issues, teachers need the knowledge and abilities to do so. To ensure that educators have the skills needed to support students successfully, ongoing professional development programs should be offered.

Accessibility and compatibility issues: It can be difficult to ensure that assistive technology solutions work with the infrastructure and platforms for education that are already in place. Some assistive technologies might not function correctly with all operating systems or might not be compatible with specific software programs. In order to overcome these obstacles and guarantee a seamless integration of assistive technology in the educational setting, it is critical to give priority to compatibility testing, usability evaluations, and ongoing support.

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VIII. CONCLUSION

In conclusion, assistive technology plays a crucial role in promoting inclusivity in education by providing students with disabilities equal access, opportunities, and support. It expands student independence and self-confidence, improves communication and participation, makes it possible for tailored learning experiences, and increases access to educational resources. Despite its advantages, there are still issues that must be resolved, such as monetary constraints, training requirements, accessibility problems, and social barriers. Educational institutions can create an inclusive environment where all students can succeed by addressing these issues through strategic investments, professional development, accessibility standards, and awareness campaigns.

By building a software application that is immersive in assistive technology and incorporates these key features, we can provide students with disabilities a powerful tool to support their learning, communication, and overall educational experience. Such an application can empower students to overcome barriers, engage actively in the learning process, and achieve their full potential, fostering inclusivity and equity in education.

Without any doubt Assistive technology is surely advancing education at every waking moment by providing equal access to learning. The future holds limitless possibilities for innovation and we need to act on that thought and create sustainable solutions to provide for this generation and the ones which will follow. The idea of integrating technology will provide disabled students with a levelled field to demonstrate their diverse skills and learn together at par with their peers. With the introduction of technology in classrooms, it is also correspondingly required to train the teachers in this regard to systematically put these tools into practice and make the classroom a comprehensive space for all.

With this paper, it is hoped that it was successful in providing the necessary ideas required to build an actual software tool and provide students with the assistance they require.

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