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Education of Children with Disabilities: Exploring Possibilities with Artificial Intelligence

Ganesh Patra

Doctoral Research Scholar, Department of Education (CIE), University of Delhi, New Delhi, India.
 E-mail: patra.ganesh143@gmail.com

Subhash Chander

Assistant Professor, Department of Education, University of Delhi, New Delhi, India. Email id: subhash3010delhi@gmail.com

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Corresponding Author: Ganesh Patra. E-mail: patra.ganesh143@gmail.com

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ABSTRACT

Current developments and practices in the field of technology help human civilization a lot in its progress. Artificial Intelligence is one of these technological advancements, which has tremendous potential and is used in various sectors. This potential needs to be explored in the field of Education too. This paper attempts to discuss some current advancements of artificial intelligence and its use in our daily life, followed by discussing the challenges faced by the teacher in classroom pedagogy, challenges faced by students with disabilities in communication, and access to various educational resources in the process of inclusion in mainstream institutions. It also discusses the challenges aroused in the education of students with disabilities due to the ongoing Covid-19 pandemic. After that, this paper explores some possibilities related to the ways artificial intelligence can be used as a medium or tool to address the discussed challenges for creating a better accessible, inclusive learning environment for all, i.e., Optical character recognition, Speech recognition, Individualization of learning, Language learning, Virtual learning and Universal Design of Learning. Eventually, it suggests some point expected to see in the near future of artificial intelligence in education, i.e., language, increasing content, modifying individualized devices, and teachers' pedagogical tools.

Keywords: ICT in Education, Artificial Intelligence, Children with disabilities, Inclusive Education.

INTRODUCTION

Education shows light to the society for its progress. Both Society and Education are influenced by each other. Our society is very diverse in terms of caste, gender, color, religion, and disability. This diversity can be a source of challenges as well as possibilities in different contexts. Diversity related to learners with disabilities have been a cause of major concern for many years. Around 15% of the world's population (1 billion people) has a disability, with 150 million being school-aged children (World report on disability, 2011). There are 26.8 million people with disabilities in India, includ-

ing 6.57 million school-aged children, ages 5 to 19 years old, who have some disability (Census of India, 2011). Only 2.13 million children with disabilities are currently enrolled in various Indian schools for the academic year 2018-19, with a large portion of this population still living outside of the education sector (UDISE plus, 2018-19). Both the outside of school and enrolled children with disabilities face discrimination and exclusion in availing of educational opportunities. Especially discrimination in education is a threat to the development of our society.

Challenges & Limitations faced by Children with disabilities in Education

Inclusion of children with disabilities in education is not an easy task. Its succession has seen various challenges. There are many challenges faced by both the children with disabilities and their teachers related to access to educational materials, communication in classrooms, pedagogy, teaching-learning methods, assessment, evaluation, and attitude of teachers in different educational setups including those termed as inclusive ones (Khairuddin et al., 2018). The traditional teaching and learning resources found accessible for so-called normal learners present significant obstacles for students with disabilities, whether physical, intellectual, or sensory (Wambaria, 2019). All these challenges increase multiple times when we consider them in the Indian context than other developed countries (Alhakami, 2017). For instance, students with cerebral palsy face difficulty accessing resources and content due to muscle movement and coordination issues. In many cases, vision, hearing, and sensation are also affected. Teachers generally find it challenging when they teach in a setup that is high on diversity including learners with disabilities. Challenges related to communication are also a big issue in schools and other institutions. This creates a bigger challenge for learners with disabilities.

The inability to use technological developments in the field of inclusive education is a hindrance in implementation at different levels. The National Policy on Information and Communication Technology (ICT) in school Education of India that came into effect in 2012 has also stressed the utilization of ICT tools for the education of learners with disabilities to create equitable access, making classroom pedagogy inclusive, teachers' professional development and collaboration among different stakeholders (MHRD, 2012). The recent National Education Policy, 2020 also focuses on various aspects of education, using ICT as a flag bearer for change. It emphasizes the importance of the widespread use of technology in teaching and learning for equitable access for all, including CWSN (Divyang) (NEP, 2020; p. 5). To address these challenges, inclusive classrooms in the Indian context can explore technological developments to make classes more accessible, learning more joyful, and a possibility of reaching out to those who have always been marginalized. The ongoing Covid-19 pandemic also propelled the technology integration practices in education through online learning (Sharma, 2021).

Problems during the pandemic of Covid-19

In general, the pandemic due to Covid-19 has increased the challenges to children with disabilities in their daily living. The children with disabilities, those dependent on caregivers, 'physical distancing' is impractical for them. Children with hearing impairments might have to remove their masks because they rely on sign language (NCPEDP, 2020, p.11). Children with visual impairments, who rely on tactile senses for navigating, are more likely to get in touch with infected areas. A 40 years old person with visual impairment named Aabid, living in Calcutta, India, said, "*You are not supposed to be touching things, but for us, we rely on touch for the majority of things, that is very challenging. You are not supposed to touch lift buttons, but how do I know what floor I should push?*" (International Disability Alliance, 2020).

In particular, their education is seriously disrupted because, in the first, online and distance education during the lockdown was not as conducive to them as face-to-face education (United Nations, 2020a, p. 12). Children with intellectual disabilities those learning get increased when they are with their friends and social groups; they are left behind during lockdown (United Nations, 2020b, p.06). Secondly, due to their poor socio-economic backgrounds, they do not have access to education-

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al facilities (Chanda & Sekher, 2020, p. 32). It is also challenging to get parental support in this online education as most of these children are first-generation learners (NCPEDP, 2020, p.22). However, despite all these immediate difficulties noticed due to the digital divide, there is much evidence of the use of technology for the education of children with disabilities in different ways. Developments related to technology, including Artificial Intelligence in the coming years can be a response to many other challenges related to education of learners with disabilities in an inclusive setup.

By the explicit use of Artificial Intelligence (AI), this inability and limitations of discrete use of ICT can also be eradicated by converting passive information into interactive knowledge. The NITI Aayog's 'National Strategy for Artificial Intelligence, #AIforAll' also stressed harnessing the power of AI for quality and interactive education in India (NITI Aayog, 2018). The recent move of UGC has also supported this.

To deal with the Covid-19 pandemic situation, the UGC has already issued its draft concept note and guideline for the blended model of teaching and learning, in which it is mentioned about the effective use of online platforms such as SWAYAM and MOOCs with harnessing the power of AI integrated ICT in the education. Chapter V of this document also mentioned the utilization of Artificial Intelligence (AI) tools in different stages of education such as content, pedagogy and proctoring, and assessment (UGC, 2021, p.28). Thus let us discuss some of the best possible ways in which the effectiveness of ICT and AI tools could be harnessed for the education of children with disabilities.

Artificial Intelligence in Education

Technology is an integral part of human civilization and its development. Technological intervention and developments have been critical for human growth and development, making life easier than ever, helping make life possible where we have never thought it would be possible to survive, and addressing many issues that threatened our survival. Artificial Intelligence (AI) has thrown tremendous potential in various sectors in this context. AI is used by everyone knowingly or unknowingly in their daily lives, i.e., using smartphones, internet surfing, online shopping, and using social media applications and navigation services. In the lower/basic level, one can find it in every Smartphone in the form of voice/virtual assistance, i.e., Google assistance, Amazon's Alexa, Apple's Siri, and Samsung's Bixby etc. Besides this, if we go for a higher level, we found that the project of fully automatic and semi-automatic smart car, drones used by various delivery agencies and militaries, are the best examples of AI users. It is going to play a significant role in the coming future. Though various debates are going on the positive and negative consequences of integrating/ implementing AI in various sectors, no doubt it has tremendous potential. This potential needs to be explored in education, i.e., in pedagogy and in making our learning experiences more inclusive. The world has gone through three educational revolutions and is experiencing the fourth education revolution, which will take advantage of information and communication technology (ICT) tools, explicitly Artificial Intelligence (Seldon & Adiboye, 2018).

Some commercial organizations also started the production of robots to teach different subjects to children, but this has not become widespread yet. For example, Robots named '*Robo Thespian*' and '*Tega*' are the robot tutors that act as teachers and help in teaching (Catlin et al., 2018). In higher-level education systems, one can find a rise of Intelligent Tutoring System (ITS). For example, an ITS called SHERLOCK, a Computer-Coached Practice Environment that provides apprenticeship training to the Air Force technicians to diagnose electrical systems problems in aircraft (Lajoie & Lesgold, 1989). The use of AI for higher-level learning has already started in the different corners of the world.

AI for the Education of CWSN

In recent years the pace with which technology has grown, the educational scenario has not utilized it efficiently for learners with disabilities. There is a considerable amount of work done on technology implementation for learners with disabilities but with very disproportionate distributions.

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Creating opportunities for diverse learners, including learners with disabilities in an inclusive classroom environment using technological developments, has reached a new height with a recent spurt in digital technologies. AI was not considered to be completely accessible to the regular lives of individuals, but with the advent of cheaper devices that use development in AI for different purposes, the possibilities of using AI in educational scenarios have also increased. For inclusive education of children with disabilities, the multiple means of access to resources and expression are very important. Teaching in an inclusive environment with access to learners with disability in every learning opportunity, making it possible for everyone to learn in an environment where opportunity is available to all the learners, is influenced by innovative use of AI. Students have differential abilities and limitations to access information, resources, and contents through verbal command, which can help them in expression and inhibition in expression of their views and ideas via this verbal command. To assist them in teaching and learning, one of the possibilities is to take the help of AI within and outside the classroom. We can use it in different stages of classroom teaching-learning, such as addressing the students' queries, providing feedback and diagnosis, and an assessment.

Multiple means of access through Optical Character Recognition (OCR)

OCR is the process of mechanical or electronic conversion of images of typed, handwritten, or printed text into machine-encoded text with the help of AI technology. It is widely used in our society. Intelligent character recognition (ICR) and intelligent word recognition (IWR) are the advanced versions of OCR which use AI to improve accuracy and recognition levels (Schantz, 1982). These are beneficial for students with disabilities in many ways, specifically the students with Visually Impairments and students with language-based learning difficulties such as 'Dyslexia' by converting the texts into speech or any other digital formats (Zabala, 2020). It will create an opportunity for multiple means of access to educational resources by children with disabilities.

Multiple means of expression through Speech Recognition tools

It is a process of enabling a computer to identify and respond to the sounds produced in human speech. It can be used in language learning. It was found very beneficial for second language learning. It can teach proper pronunciation, in addition to helping children develop fluency with their speaking skills (Shadiev et al., 2014). Students with visual impairments can benefit from using their voice commands instead of looking at the screen and keyboard. Students with physical impairments also benefited by using it through their voice command while not accessing the pen, keyboard, or mouse with their physical organs (Shadiev et al., 2014). It is also helpful to the students with learning disabilities to increase their writing, spelling, punctuation, and other mechanics of writing (Follensbee et al., 2000). These days, virtual platforms like Google Meet, Zoom, WebEx, Microsoft Teams, and so many others at a higher use have a feature of 'Subtitle' that identifies and responds to the sounds produced in human speech into texts. Dysgraphia and Cerebral Palsy are benefited a lot from its use. These days, for qualitative assessment where students asked to submit their assignments online, students with dysgraphia and cerebral palsy who face difficulties in writing may submit their assignment as audio files that can be converted into a text file with the help of these speech recognition tools.

Language learning through Verbal command-based Interactive system

It would be beneficial for a child with a learning disability to correct the pronunciation and develop scientific knowledge with a planned intervention. It would require developing specialized applications for these devices using AI to use it with students with learning difficulties. These applications can be supplementary to the vast amount of information available at verbal command to the students. Also, these applications can individualize the information with respect to the extent with the information is needed for the learner. The interactive feature of these AI based devices can help the learners build understanding about the concept apart from creating an interactive atmosphere for learning out of schools where the teachers are not available. An experiment based on utilizing an interactive mobile learning application was found helpful in improving the writing proficiency of child-

ren with dyslexia (Tariq & Latif, 2016). The verbal command-based interactive system is just the beginning of AI being used in the educational scenario. In 2018, an experiment was conducted on the students with language disorders at an elementary school in northern Taiwan to enhance their language learning with the help of a virtual environment of Human-computer interface (HCI) design that used AI technology showed positive results (Yu-Ju et al., 2018).

Individualization of Learning

Every child is unique and learns differently. Individualized teaching-learning was found more effective. Children with disabilities tend towards a more individualized learning environment. AI can be used for a highly individualized learning experience where children with disabilities can benefit from a device that would be available to them every time. Students with disabilities face the challenge during information processing by sensory experience and learning ideas and concepts that create an additional challenge to those with learning difficulties. For example, for learner with visual impairment, AI can be developed as a ‘buddy,’ who would help the learner in expansion of idea. Considering this expansion to be critical for all learners, it would be interesting to use it to help everyone.

Virtual Learning & UDL

In the recent future, it may be possible that laboratories and classrooms can create a virtual learning atmosphere where AI can help in building Universalized Design for Learning. Apart from helping learners with disabilities to virtually experience and access things which at present they can't do without help of other human. It would reduce their dependency on others and live with independence. To avoid the risk of actual experimentation in laboratories, we can take the help of augmented reality (AR) and virtual reality (VR) to conduct these experiments.

SUGGESTIONS

English is found as the most used language in AI. Many others do not know English. Thus, it is desirable to make the AI facility available in other national and international languages as well as in local languages. Language should not be a barrier to access Education through AI. In this case, Google's ‘Project Navlekha’ that helped create a platform for the Indian regional language publications to go online is very helpful (The Hindu, 2018).

To make education more accessible through AI, more content must be accessible through AI first. It should not be limited to higher-level learnings only. There is a need to increase the utilization of AI from pre-primary to higher education, and every book should be accessible through AI.

With the help of AI, individualized devices can be developed and popularized to assist a child individually suffering from a particular problem. It will help the child to be independent in accessing the content or resources. This can be developed in the form of a Robot, which can be used as a home teacher or tutor like ‘*Robo Thespian*’ and ‘*Tega*’.

Teachers should be trained to use and integrate AI in their classrooms to create a better learning environment. Pre-service and in-service teacher training programs, professional development programs should be focused on sensitizing the teachers to use and integrating AI in the classroom.

CONCLUSION

It is not too far when we can see the world operated by Artificial Intelligence and as a technology dominating every sector. Although the use of technology and AI is critical for communication among individuals in many ways and to solve difficult problems, we need to use it as a facilitator for humans in different avenues. AI can help create an inclusive society where individuals have better access to everything and can communicate more easily with others. Although it requires a lot of effort and research to recognize the potential of AI in the educational scenario, it would not be far when we see AI being used in every domain of education. It would also be imperative that AI can make the learning and experience of a learner in an institution more inclusive. Apart from the regular edge

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technology has over human interface, it would also create new possibilities where the children with disabilities may have individualized learning opportunities enabled by the innovations brought by AI. Issues and challenges in an inclusive classroom, where the teacher has felt the inadequacies regarding instructional design and assessment possibilities, would be more conducive for learning to all with the help of AI being used more effectively.

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