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TRANSFORMING TRADITIONAL CLASSROOMS: HARNESSING TECHNOLOGY FOR INCLUSIVE AND ACCESSIBLE EDUCATION

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ABSTRACT

The classrooms are being transformed with the advent of technology by revolutionizing traditional classroom settings resulting into the creation of valuable opportunities for inclusive and accessible education to all. This paper is an attempt for the exploration of potential role of Educational Technology (EdTech) in the transformation of traditional classrooms into those capable of bridging the learning gaps and promoting such learning environments promoting academic equity. There are so many digital tools, adaptive learning platforms, assistive technologies and AI-based applications that can be integrated for the transformation of traditional classrooms into one, who are in the process of evolution for catering the diverse needs of learners of different nature and background. There are some specific kind of learners also, who are suffering from disabilities and belongs to marginalized communities of the society. For the needs of such learners, this kind of transformation not only enhances the quality of education best suited to them but also capable of fostering an inclusive culture and feeling of global citizenship among them. The present paper is an attempt of judging the suitability of various technological interventions that can be applied for the enhancement of students' educational engagement, academic achievement and personalized learning. Furthermore the paper addresses the challenges which are usually faced by various stakeholders in implementing the EdTech in educational Institutions of different backgrounds. The findings from the paper highlights that an inclusive and accessible educational environment can be created through the suitable use of technology leading to the adoption of a holistic approach in education.

Keywords: EdTech, Inclusive Education, Accessible Learning, Digital Tools, Adaptive Learning, Assistive Technologies, Global Citizenship

1. INTRODUCTION

In educational sphere, a new era has started with technology intervention and its enhanced usage leading to the transformation of traditional classroom settings into dynamic and interactive learning environments. This paradigm shift in teaching learning process is particularly significant in ensuring inclusive and accessible education to the students of diverse cultural and socio-economic background. In this context, technology is playing a powerful role in removing the existing educational disparities among learners at various levels of schooling. By going through the historical evolution of EdTech, the effectiveness of technological interventions can be justified in creating equitable learning environments for all students. After Corona crisis, all educational institutions are facing some common challenges in order to ensure the availability of inclusive and accessible educational environment with the advent of technology in education sector.

1) **Historical Overview of Technology Usage in Education:** The education sector at all levels, has faced a visible transformation with the advent and evolution of EdTech. This transformation has not achieved in a single attempt but it is marked by a step by step approach covering some significant milestones leading to the modernization of

traditional teaching-learning processes. In early 20th century, the journey of technology usage in education started with the simple use of Audio-visual aids e.g. Film strips, OHP and simple radio broadcasts as a supplement to traditional teaching-learning system. "The early use of technology in education was primarily focused on enhancing the delivery of instruction through visual and auditory stimuli." (Saettler, 2004; p. 67). The concept of Interactive Learning started in 1960s and 1970s with the introduction of computer-based instruction (CBI) and computer-assisted instruction (CAI), which provided tutorial programs based on drill-and-practice exercises leading to the foundation for more sophisticated educational software (Molnar, 1997).

2) **Important Milestones in the Development of EdTech:** In the late 20th century with the advancement of computers and internet, rapid advancements were observed in the field of EdTech. The World Wide Web was introduced 1990s, which revolutionized access to information and educational resources leading to more interactive and collaborative learning environments. According to Means et al. (2009), "The internet enabled the creation of a global learning community, where students and educators could connect, share resources, and collaborate on projects regardless of geographical boundaries" (p. 281). The early 2000s witnessed the development of E-learning platforms and learning management systems (LMS), such as Blackboard and Moodle, which proved very helpful in the facilitation of the process of educational administration, documentation, students' progress tracking and successful organization of various academic and training programs. These developments at later stage provided an instrumental supports for the creation of blended and online learning environments. As observed by Luckin et al. (2016), "In recent years, the integration of artificial intelligence (AI), virtual reality (VR), and augmented reality (AR) in education has opened new frontiers for immersive and personalized learning experiences. AI-driven adaptive learning systems, such as DreamBox and Knewton, offer customized learning pathways based on individual student performance and preferences."

3) **Current Trends and Innovations in EdTech:** Now a days, EdTech still continues to advance due to recent advancements in the field of mobile technology, cloud computing, and data analytics. This kind of learning is extremely beneficial in the regions deprived of basic educational infrastructure. The another advancement is Cloud Computing, rightly described by Anderson (2020) as, " The technique, which has revolutionized the way educational institutions store, manage, and share data, enabling seamless collaboration and access to resources across different locations. Platforms like Google Classroom and Microsoft Teams have become integral to remote and hybrid learning models, especially during the COVID-19 pandemic." Further there are Data and Learning Analytics tools, which are being used effectively to track student performance, identify learning gaps, and provide targeted interventions. "These tools help educators make data-driven decisions to enhance teaching effectiveness and improve student outcomes" (Siemens, 2013). As we look in to the future of EdTech, it seems to be very beneficial in promoting the innovation and improvement of educational experiences. But it becomes mandatory to make a proper use of these innovative technological advancements for creating an inclusive and accessible educational environment, capable of fulfilling the different kind of needs associated with learners from diverse backgrounds.

Making Inclusive Education a Success through Technology: There was a time in the field of education where the students were grouped on the basis of their certain characteristics abilities and limitations, leading to the formation of a kind of educational set up which was against the fundamental principles of oneness and integrity. The solution was put before by the concept of inclusive education, which is a fundamental principle aiming at to ensure that equal opportunity is provided to all students for learning and making progress together, irrespective of their physical, social and cognitive limitations. According to Ainscow and Miles (2009), "Inclusive education involves the practice of educating students with and without disabilities in the same classroom environment. This approach is grounded in the belief that all children have the right to a good quality education that respects their individuality and ensures full participation in societal activities. The significance of inclusive education lies in its potential to promote social integration, reduce discrimination, and improve educational outcomes for all students." Some of the digital tools and resources that have revolutionized the inclusive education are being described as under:

1) **Assistive Technologies:** Assistive technologies (AT) includes a different kind of devices and software, designed to support students having certain limitations in accessing the curriculum material and participating in classroom activities. These technologies may include devices like screen readers, which have the ability of converting the text to speech for visually impaired students; and there are speech-to-text applications also, which assist students with physical disabilities in writing and communication. According to Edyburn (2010),

"The use of assistive technology can significantly enhance the learning experience of students with disabilities by providing them with the tools they need to overcome barriers and achieve academic success" (p. 35).

2) **Adaptive Learning Platforms:** As we know that the use of AI is increasing day by day in the field of education on a very fast pace. Adaptive learning platforms is basically an AI-based application which utilize artificial AI and machine learning for designing of personalized learning experiences for individual students keeping in mind their personal needs. For designing such experiences, individual performance data of students is utilised by these platforms in order to adjust the content and pace of instruction for providing appropriate level of challenge and support. Luckin et al. (2016) specifies, "There are tools like DreamBox and Knewton which presents such potential examples of ideal adaptive learning platforms, which caters to the diverse learning needs of learners and promote inclusivity in education."
3) **Digital Content and Multimedia Resources:** In addition to the above tools, there are technology-based resources including; digital content, E-books, Videos and Interactive Simulations, which offer flexible and engaging learning materials. These materials can be designed in order to cater the needs of students having different learning styles and preferences. Al-Azawei et al. (2016) rightly observed, "Multimedia resources enhance the accessibility of educational content by providing multiple means of representation, engagement and expression. For instance, there are videos with closed captions and transcripts which ensure that students with hearing impairments can access the same information as their normal peers."

Enhancing Accessibility through Technology: Accessibility in education means to ensure equal access to educational resources, opportunities and digital tools for all students irrespective of their backgrounds i.e. their physical, sensory, or cognitive abilities. In traditional educational set up, it is not possible to ensure equal access for all learners without technological interventions in teaching-learning process. Technology can play a crucial role in the enhancement of accessibility for all students to good quality educational resources by employing various ICT-based tools and resources, tailored to meet the different kind of learning needs of learners. According to Black et al. (2008), "The integration of these technologies into the classrooms is not only a legal and ethical obligation but also a means to create a more inclusive and effective educational environment." There are various kind of technological tools that have been developed to make education accessible for all. Some of these tools are being described briefly as under:

1) **Screen Readers and Text-to-Speech Tools:** "Screen readers are software programs that convert digital text into synthesized speech, enabling visually impaired students to access written content. Popular screen readers such as JAWS (Job Access with Speech) and NVDA (Non Visual Desktop Access) have become essential tools for students with visual impairments" (Black et al., 2008). Text-to-speech (TTS) tools are able to convert written text into spoken words which are extremely beneficial for the students suffering from learning disabilities e.g. dyslexia, as these tools provide auditory support for reading and comprehension.
2) **Closed Captioning and Subtitles:** For the students suffering from hearing impairments, closed captioning and subtitles are very crucial for students as textual representation of spoken dialogue and sounds in multimedia content can be provided through it. According to Siemens (2013), "This kind of technology ensures that these students can access videos, lectures, and other audio-visual materials on an equal footing with their peers." Further Siemens (2013) reported that closed captioning is capable enough to support students with hearing impairments but it also helpful for language learners and as it improves overall level of comprehension and retention.
3) **Interactive and Customizable Learning Materials:** The students can be engaged with the desirable content through Interactive and customizable learning materials in the ways that suit to their individual learning needs and academic preferences. "One of the basic example of such kind of material is; Digital textbooks which includes specific features like adjustable text size, colour, contrast and interactive elements e.g. quizzes and multimedia content. These features make learning materials more accessible to students with a range of disabilities, including visual, auditory, and cognitive impairments" (Suhr et al., 2010).

Constraints in Implementing the EdTech for Accessibility: Despite so many benefits of EdTech in ensuring the access and inclusivity, there are various challenges that significantly affect its rate of success in the field of education. It is evident that from the above discussion that EdTech has immense potential to transform learning environments into inclusive and accessible channels. But its implementation is subjected to some significant challenges and considerations related to various stakeholders. These challenges span from the issues of digital literacy, suitable infrastructure and suitable teacher training to lack of will for bridging the digital divide among learners.

1) **Lack of Digital Literacy and Competency:** For implementing any kind of technological intervention all the stakeholders e.g. teachers and students both need to be digitally competent and literate. A person is said to be digitally literate if he has the ability to use digital tools and resources effectively, evaluate digital content and understanding of ethical use of digital resources. Hatlevik et al. (2018) mentioned, "Digital competence is essential for participating in a society where knowledge and communication are increasingly mediated by digital technologies."
2) **Infrastructure and Access to Technology:** Availability of suitable technical infrastructure also plays a critical role in using EdTech for achieving accessibility and inclusiveness in education. There are so many educational institutions in India, which are facing infrastructure scarcity e.g. low speed internet connection, outdated hardware and lack of technical support. For solving these issues there is an urgent need of substantial financial resources from the Govt. or private management. According to a report issued by the World Bank in 2020, "Investing in digital infrastructure is crucial for enabling widespread access to quality education and for closing the digital divide."
3) **Teacher Training and Continuous Professional Development:** Effective implementation of EdTech significantly depends on the ability of teachers to integrate technology in teaching-learning process. There should be a provision of continuous professional development programs that must be designed for providing technical skills including pedagogical strategies in order to enhance the learning outcomes. Darling Hammond et al. (2017) emphasized, "The training sessions should include necessary skills for using adaptive learning platforms, assistive technologies and digital content according to the needs of students. High-quality professional development is a key component in preparing teachers to utilize technology in ways that can transform teaching and learning." (p. 17).
4) **Ensuring Equity and Addressing the Problem of Digital Divide:** Digital divide was described by Darling-Hammond et al. (2017) in the following words, "The gap between those who have access to modern information and communication technology and those who do not." Digital divide presents a significant challenge in ensuring equity among learners from different socioeconomic backgrounds and disadvantaged sections of the society, leading to poor access of necessary technology and internet connectivity. There should be a provision of targeted interventions e.g. subsidized internet connection, free or subsidised devices to the needy and digital literacy programs. In a document carried out by UNESCO (2020), it was asserted, "Bridging the digital divide is essential for ensuring that all students have the opportunity to benefit from digital learning."

2. CONCLUSION

There are some potential benefits associated with EdTech-usage, which can ensure inclusivity and equity in access to different kind of learners, through the proper adoption of technology in the field of education. But by ensuring some provisions like enhancement of digital literacy, efficient infrastructure, continuous teacher training, and bridging up the digital divide for ensuring equity, effective implementation of EdTech can be ensured. There are various strategies through which educational institutions can be successful in creating a more inclusive, effective and accessible learning environment in order to fulfill the diverse academic needs of all students. The integration of EdTech into traditional classrooms can transform these classrooms into more inclusive and accessible learning centres. The various ICT-based interventions e.g. digital tools, adaptive learning platforms and assistive technologies can be used by the teachers for the fulfilment of unique needs of different kind of learners and thereby ensuring better academic success. It is the effective implementation of EdTech which will decide the future of education in terms of ensuring equity and inclusivity in 21st century.

CONFLICT OF INTERESTS

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