Impact of Metaverse on Education: Challenges & Future Scope

Dr. Anil Kumar Lamba[1], Dr. Poonam[2]

[1]Professor, School of Computer Science and Engineering, Geeta University Delhi NCR, Panipat, India

[2]Assistant Professor, School of Computer Science and Engineering, Geeta University Delhi NCR, Panipat, India

Email: anil.lambain@gmail.com, Poonam.152jp@ gmail.com

Abstract: Since the technological revolution, traditional learning has been upgraded. The Metaverse has drawn a lot of interest from big data and cyber-physical system developers for a variety of applications. As a transformative social work notion, the Metaverse consists of several sorts of technology, e.g., big data, interactivity, artificial intelligence, game design, Internet computing, Internet of Things, and blockchain. It is expected that using Metaverse we can make advancement in education. The Metaverse's educational architectures, however, are still in their infancy. We need to answer a lot of questions regarding the Metaverse in education. In order to achieve this, study intends to present a thorough literature evaluation of the use of Metaverse in education and also in-depth analysis of the Metaverse in education is presented in this study, with an emphasis on the most recent developments, issues, possibilities, and future prospects. We begin by giving a concise introduction to the Metaverse in education and outlining the rationale for its inclusion. Then, we did a comparison between traditional education with online and Metaverse education. We tried to find out the future contributions of Metaverse education with its advantages and disadvantages. Lastly, we highlight a number of difficulties and problems in this promising field.

I. Introduction

The Metaverse is all the rage in the digital world right now due to its seemingly endless possibilities and goals. Many investors are drawn to the Metaverse, which is at the forefront of technological and digital discovery. It is an environment where the physical and digital worlds coexist and can have a profound impact on fundamental areas of daily life. Essentially, this is a universe of infinitely interconnected virtual communities where people can connect, collaborate, and have fun using virtual reality headsets, augmented reality glasses, smartphone apps, and other technologies. increase. It also includes additional aspects of your online life, such as social media and shopping. As application scenarios mature, the metaverse evolves into a very large, very open, dynamically optimized system [1]. Developers from different disciplines work together to create systems that can support a variety of virtual reality application scenarios. The term "Metaverse" is brand-new to everyone as a buzzword.

It serves as a guide for improving all facets of human growth. The distinctive features of the Metaverse include decentralization, the blending of virtuality and reality, high levels of human-computer interaction, and the rapid development of Internet communication techniques and hardware platforms. Researchers believe that the Metaverse in teaching is feasible for this reason. Everyone in the Metaverse is able to produce a variety of digital goods. Moreover, interactions between people will be more adaptable and practical (for example, virtual to virtual and virtual to realistic). In a broad sense, education refers to a person's ongoing learning activities (such as career training, skill development, and cognitive development) [2]. With the rise of the Internet over the past ten years, traditional education has been incorporated into Web 2.0. For instance, Massive Open Online Courses (MOOCs) can make the sharing of educational content possible online. But since it continues to rely on textbooks, classrooms, and material distribution, it does not alter the fundamental approaches [3].

II. Impact of Metaverse on Education

Despite being a buzzword, the majority of people are still unaware of the Metaverse. Is the use of the Metaverse in education fruitful or unfruitful? What novel features or ideas result from the fusion of Education with the concept of metaverse? Will it lead to more disputes and make things worse? These queries have not been addressed. This research seeks to perform a thorough literature review on the use of the Metaverse in education to close this gap. Covid 19

changed the traditional education in Online Education, but this new technology changes online education into Metaverse education [4].
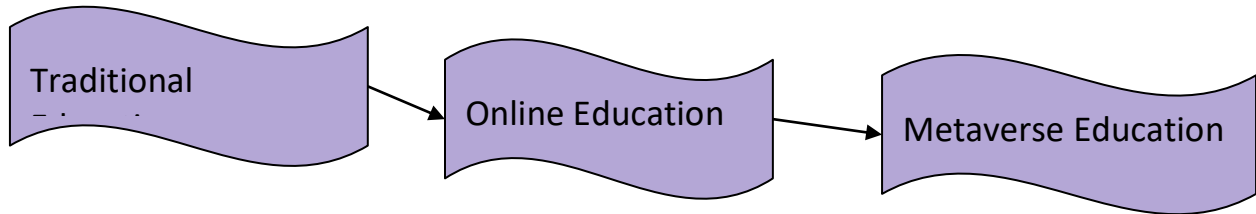

Figure 1: 3 Educational Models

In this paper, we conducted the comparative study between the above educational models (Figure1). Not just academics and educators should welcome and get ready for the new revolution in educational methods that is about to take place. Generation 22 is accustomed to adopting online education today. The digital world has a similar significance to the physical world in their long lives. When they were young children, computers, smartphones, and the Internet were all around them. As digital natives, Generation 22's education must provide challenges in terms of effectiveness and participation. Table 1 shows the comparative study between three educational models.

The [5] Metaverse is a massive structure that owns various futuristic digital capabilities. The Metaverse reality offers many advantages, including interaction, authenticity, and portability. The new educational system must be revised in order to maintain accessibility and ensure its continued existence.

Table 1: Comparative Study of 3 Educational Models

	Traditional Education	Online Education	Metaverse Education
Area	School, College,	School, College,	School, College,

	University	University, anywhere	University, anywhere
Learning Scene	Real Time Learning	Real & Non-Real time Learning	Simulated Learning
Learning Resources	Printed	Printed and soft Material	Visualized or Decentralized Resources
Learning Activity	Physical Interaction of Students and Teachers, Peer to Peer, Fixed	Flexible, Not Peer to Peer, Not Physical Interaction of students and teachers	Remote Collaboration, Virtual Activity, Flexible, Creative Learning, inquiry based Learning
Learning Objective	Develop low order cognitions	Develop low order cognitions	Develop high order cognitions
Learning Assessment	Result based on Summative data	Result based on Summative data	Result based on Summative data and Formative data
Technology Support	None	web2.0	Web 3.0

III. Future of Metaverse in Education

As we all know, the pandemic changed classroom education into online education. This epidemic made the education system more responsive to implementing cutting-edge or future technologies. Education is successfully delivered only if it can engage learners. Better engagement leads to better retention of learned

information. Technology is standardized to ensure for connecting with students and improving their engagement with the course material. In the field of education, metaverse enables students to participate in remotely accessible virtual classes that simulate aspects of a traditional classroom. Physical barriers are being removed while education institutions and technology firms try to make them more immersive, engaging, and communicative [6].

Table 2: Pros and Cons of Metaverse in Education

Metaverse Pros in Education	Metaverse Cons in Education
Flexible Learning concepts with an interactive curriculum	Difficult to track what our kids are doing online, and that challenge will continue with the metaverse.
Learning with gamification	VR "hangovers"
Making Teaching more effective	gaming addictions & spend all time
Discovering Education quickly	VR experiences require high-tech, expensive headsets as well as strong and reliable connectivity.
Practical Learning with participation in real scenario	1) *Desensitization*
Create realistic environment for learning	People hack our avatars and steal our online identities.
Formative and summative assessment of Learner	VR-headsets will include eye-tracking technology,

IV. Challenges of Metaverse in Education

Classroom [7] education is going to change in a new world i.e virtual 3D classrooms known as metaverse education. We found many US universities changed their education pattern in Metaverse terms. One Meta-varsity builder, New Mexico State University, says it wants to offer degrees in which students can take all their classes in virtual reality, beginning in 2027.We found many benefits to taking classes in metaverse environment such as more realistic environment, virtual reality,[8] easier access of distant or faraway students. But there are still some problems and challenges in metaverse education.

- **Cost & Time**: Universities [9] incur additional costs due to the purchase of virtual reality headsets, virtual reality content licenses, and the building of digital twin campuses. Virtual reality headsets entail additional fees. Although Meta is giving out a handful of its Meta Quest 2 virtual reality headsets for free to the met-aversities that Meta and Victory-XR are launching, it may not be enough.
- **Data Privacy & Security**: A [10] wide variety of user data, including physical movement, heart rate, pupil size, eye openness, and even emotional signals, can be gathered by the virtual environment and its technology.

  In the metaverse, cyberattacks may even result in bodily injury. Metaverse interfaces deliver information directly to users' senses, essentially fooling the user's brain into thinking they are somewhere else. Attackers of virtual reality systems have the ability to control the actions of users while they are immersed, including pushing them into potentially hazardous situations like climbing a stairway.

- **Limited Rural access to new technology infrastructure**: Applications [11] that use a lot of metaverse bandwidth include 3D movies. To manage all of the information flowing between sensors and users across the virtual and real space, they need high-speed data networks. The infrastructure necessary to support the streaming of high-quality metaverse content is lacking for many consumers, particularly in rural locations.
- **Challenge to adapt new technologies**: A school's approach to teaching and learning must be drastically altered in order to build and launch a meta-varsity. For instance, metaverse students actively participate in virtual reality games and other activities rather than just consuming content. Advanced technologies, such as

virtual reality and game-based learning, combined with artificial intelligence can produce individualized learning experiences that are not experienced in real time but rather through the metaverse. Learning in the metaverse [12] may become less regimented and more governed by automatic systems that adjust the curriculum and learning pace in accordance with the student's aptitude and interests.

V. Conclusion & Future Scope

We have done the comparative study of educational models such as traditional education, online education and metaverse education on the different factors such as area, learning scene, learning resources, learning objective, learning activity and technical support. With the help of this study we can conclude how the factors affect the educational models. Also, we had discussed pros of using Metaverse in education such as flexible learning, practical learning in real scenarios and how to create a realistic environment for learning. Discussion was done on the cons of Metaverse on education such as tracking kids' activity, gaming addictions, stealing of identity and many more. At last, we have discussed the challenges that we are facing when we are using Metaverse in education in different educational models.

Metaverse enables novices in education sector to attend the classes in online mode but at the same time they will experience the feeling of actual classroom. Institutes which are involved in education & skill corporations are working in the direction of eliminating physical barricades whereas constructing them extra immersive, appealing, & unrestrained.

References:

[1] B. Kye et.al. Jo, "Educational applications of metaverse: possibilities and limitations," Journal of Educational Evaluation for Health Professions, vol. 18, pp. 1–32, 2021.

[2] L. H. Lee et.al. "All one needs to know about metaverse: A complete survey on technological singularity, virtual ecosystem, and research agenda," arXiv preprint arXiv:2110.05352, pp. 1–66, 2021.

[3] H. Ning et.al. "A survey on metaverse: the state-of-the-art, technologies, applications, and challenges," arXiv preprint arXiv:2111.09673, pp. 1–34, 2021

[4] M. A. I. Mozumder et.al. "Overview: Technology roadmap of the future trend of metaverse based on IoT, blockchain, AI technique, and medical domain metaverse activity," in the 24th International Conference on Advanced Communication Technology. IEEE, 2022, pp. 256–261.

[5] M. Sharples and J. Domingue, "The blockchain and kudos: A distributed system for educational record, reputation and reward," in European Conference on Technology Enhanced Learning. Springer, 2016, pp. 490–496

[6] N. Friesen, The textbook and the lecture: Education in the age of new media. JHU Press, 2017

[7] J. Parong and R. E. Mayer, "Cognitive and affective processes for learning science in immersive virtual reality," Journal of Computer Assisted Learning, vol. 37, no. 1, pp. 226–241, 2021.

[8] Y. Georgiou, O. Tsivitanidou, and A. Ioannou, "Learning experience design with immersive virtual reality in physics education," Educational Technology Research and Development, vol. 69, no. 6, pp. 3051–3080, 2021.

[9] H. Kanematsu et.al. "Multilingual discussion in metaverse among students from the USA, Korea and Japan," in The International Conference on Knowledge-Based and Intelligent Information and Engineering Systems. Springer, 2010, pp. 200–209.

[10] M. Rothmeyer, "Augmented reality in education," https://mobcoder.com/blog/augmented-reality-in-education/, 2021.

[11] P. Maharg and M. Owen, "Simulations, learning and the metaverse: changing cultures in legal education," Journal of Information, Law, Technology, vol. 1, pp. 1–28, 2007

[12] P. Daniel et.al. ´ "An introduction to the metaverse for education," https://www.meridiantreehouse.com/metaverse-education-guide, 2022.