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Teaching and Learning in the Metaverse World: The Future of New-Gen Education

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Abstract : The change in the education system to meet the needs of the students of every generation is inevitable. The education system is transforming towards technology catering to the requirements of Generation Y and Generation Alpha. The online teaching practice has many issues and concerns among students, like lack of interaction, inactiveness, incuriosity, and ineffectiveness. The innovation in technology by incorporating Virtual and Augmented Reality (VAR), Artificial Intelligence (AI), holograms, virtual laboratories, blockchain technology, and the Internet of Things (IoT) can make it more effective. The metaverse is a web of three-dimensional virtual environments centered on socializing, which utilizes the above- said technologies. Metaverse delivers an immersive learning experience for the students and increases class involvement, making learning more exciting and active. Its expansion has been aided by superior information technology enterprises such as Meta Platforms, Epic Games and Microsoft. Metaverse has also raised concerns like privacy, security, societal and psychological issues among users. Further research into the application of metaverse application in education can shed more light on it as we need to prepare the educators and learners of the near future.

Keywords : Metaverse, Generation Alpha, Virtual Augmented Reality, Online education, Roblox.

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Understanding The Change In Student Generations

Heraclitus a famous Greek philosopher of Ephesus who lived around 500 BCE claimed that the essential, underlying essence of life as 'change' and it is the only constant. Because the entire nature of existence is change, nothing in life is permanent, nor can it be (Müller-Merbach, 2006). The change has driven the world in every aspect like evolution, nature, culture, science, technology, politics, economy, etc. Education has also undergone change at multiple time periods due to various factors. The most prevalent factor deciding the change in education is the characteristic features of the different student generations (Seemiller & Grace, 2016). Many systems and philosophers worldwide have named and classified the population from different generations into multiple categories (Dimock, 2019). The most commonly known and discussed generations are: 1. Silent Generation – who were born before 1945, 2. Baby Boomers – who were born between 1945 – 1964, 3. Generation X – who were born between 1965 – 1980, 4. Generation Y or Millenials – who were born between 1980 – 1995, 5. Generation Z or iGen or Centennials – were people born after 1995 (Rue,

2018). The characteristic features of the above five class of generations are depicted in Figure 1.

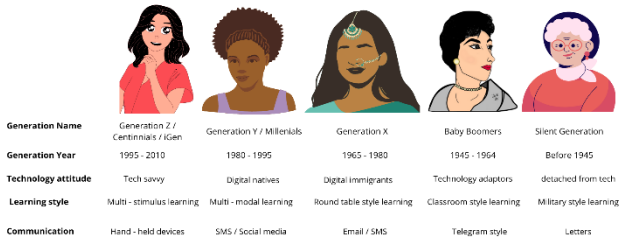

Fig. 1: Representation of Some Important Characteristic Features of Five Classes of Generations From Silent Generation to Generation Z.

Apart from these five generations few reports and articles state that the researchers have coined name for one more generation who were born since 2010 as "Generation Alpha" (McCrindle, 2021). The detailed characteristic of the Generation Alpha is depicted in the Figure 2.

Fig. 2 : Representation Of Some Important Characteristic Features Of The Generation Alpha

The student generation currently pursuing University education is mostly generation Z and in near future it will be generation Alpha. The teaching community is occupied mostly by Millennia's with little of generation X population. Due to the gap in the generation it is utmost important to understand each other generations characteristics and work upon to fill the gaps (DeIuliis & Saylor, 2021).

Role Of Technology In Teaching Generation Z And Alpha

From the previous section, it would be clear that the generations Z and Alpha both are digital natives as they were born in the era of smartphones and internet. Generations Z and Alpha both get their information via the internet and are focused on finding information quickly (Szymkowiak et al., 2021). Edu-Tech is an already well-established term for this generation as depicted in Figure 3.

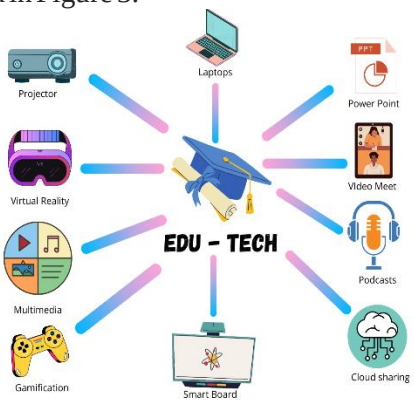

Fig. 3 : Representation of Few Technologies Currently Been Adapted in the Field of Education.

Considering the global impact of COVID-19, this generation students have very well been exposed to the virtual classes and online learning. Digital cameras, projectors, laptops, Power point presentations, and 3D visualization tools have all become established valuable resources for teachers in assisting pupils in grasping concepts quickly (Raja & Nagasubramani, 2018). As the innovation in technology is changing, so do the use of it in education system. Virtual and Augmented Reality (VAR), Artifcial intelligence (AI), Holograms, Virtual laboratories, Blockchain technology, internet of things (IoT) are the technologies which is going to transform the future of Education (Hernandez-de-Menendez et al., 2020). In this article, we will focus on the applications of metaverse in education for the future.

Metaverse – A Digital World

The metaverse is a post-reality cosmos that combines physical reality and digital virtuality in a continual and persistent multiuser environment (Mystakidis, 2022). The technologies like VAR and AI along with extended reality (XR) is used in creating this social immersive environment of metaverse (Sparkes, 2021). The concept of metaverse got popularized throughout the world after Facebook announced in October 2021 that the firm would be renamed as "Meta". A fictional metaverse universe called "OASIS" was also depicted in the 2018

American science fiction movie titled 'Ready Player One' directed by Steven Spielberg, which was made based on the novel of the same name by Ernest Cline (Wiederhold, 2022). University of California, Berkeley's graduation ceremony was conducted on Minecraft in 2020, and they have also virtually reconstructed their University campus using the Minecraft server called as Blockeley (Neil & Velazquez Fidler, 2021). Many of the marketing campaigns of top brands use the metaverse nowadays to promote their product (Hollensen et al., 2022). A timeline chart of metaverse application in modern world is depicted in Figure 4.

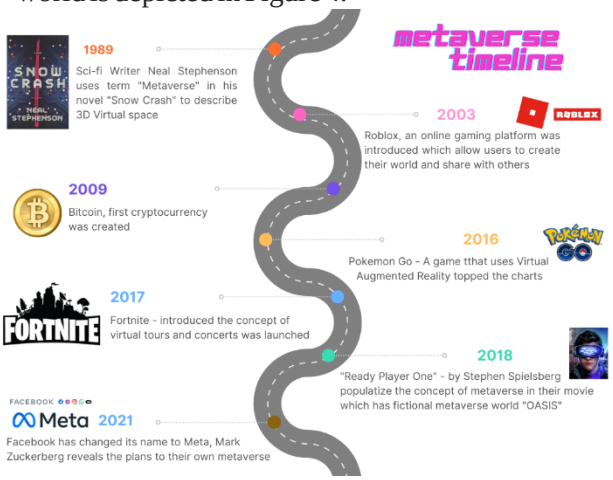

Fig. 4 : Time Line Representation Few Important Global Events Associated With the Theme of Metaverse

As mentioned above, the metaverse has already evolved into an extension of our daily lives that may be able to meet our needs.

Need Of Metaverse In Education

In March of 2020, the students and educators grudgingly plunged into the new normal mode of online teaching and learning which was requisite of the entire society during the pandemic lockdown (Syam & Achmad, 2022). Though, by the end of 2021 most of the countries resumed back to normal mode of offline education, the impact of the online education has not completely moved out. Emergency situations like recurrent waves of new infection threats, natural calamities, war alerts and much more require the teaching – learning process to continue in remote environment (Casper et al., 2022). Remote learning has already become inevitable and will be so in the future. But, the existing online teaching – learning process lacks the collaboration, practical experience and interest to the students (Coman et al., 2020). The various concerns pertaining the existing online teaching methodology is depicted in Figure 5.

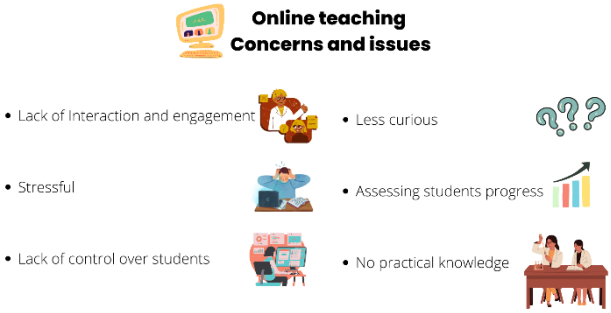

Fig. 5 : Illustration Of Few Concerns and Issues Associated With Existing Online Teaching Practices.

The main benefit of metaverse is the experience it provides for students, since it allows them to have an immersive learning experience and boosts their participation in class, making learning more interesting and active (Lee & Hwang, 2022). Authors Roberta Michnick Golinkoff and Kathy Hirsh-Pasek in their reputed book "Becoming Brilliant: What science tells us about raising successful children" has introduced the 6Cs — collaboration, communication, content, critical thinking, creative innovation, and confidence which they claim are the skills mandatory for the successful students in the 21st Century (Golinkoff, R. M., & Hirsh-Pasek, 2016). A metaverse can be created to provide a setting and experiences that support and encourage these 6Cs (Hirsh-Pasek et al., 2022) as depicted in Figure 6.

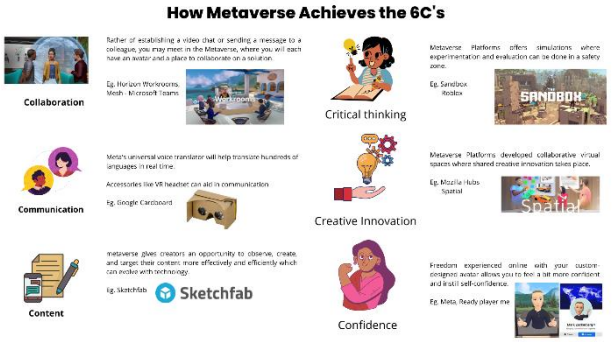

Fig. 6: Illustration of various attributes of metaverse through which it achieves the 6Cs.

Implementing Metaverse For Education

The metaverse can be used in a variety of educational settings, including arithmetic, engineering, STEM education, and aviation instruction (Alam & Mohanty, 2022). Metaverse enables students to engage with virtual aircraft during aircraft instruction. The virtual contact enhances

learning and practice about flying by providing experience that is very similar to reality. Additionally, metaverse can be utilized in STEM education to properly present applications (Akour et al., 2022).

Fewer researches employed the augmented reality metaverse, and even fewer used the lifelogging and Mirror Worlds modes of metaverse (Yu, 2022). The majority of studies in education concentrated on the virtual world's mode of metaverse. Because it can offer technical support for the field, such as 3D modelling computer programmes for courses, assistance to students in making connections between experiments and virtual objects, and autonomous tutoring systems based on user interaction data mining (Pereira et al., 2012).

Imagine a scenario where the teacher is planning to teach anatomy of a human body in the metaverse platform. The students apart from learning the context they also virtually travel through the different parts of the human body and have an adventurous learning (Makransky & Mayer, 2022). The metaverse can provide students their own virtual excavations in an archaeology course (Getchell et al., 2010). This way of learning creates an interest in the student community and also enhances the understanding of the topic.

Metaverse also creates a gamified learning where each student can be in their metaverse avatars, earn online points / currency for completing the tasks / assignments, compete with other students through the leaderboard, unlock new levels through achievements in each level and can team up with other peers in solving a problem in game style (van Rijmenam, 2022) as represented in Figure 7.

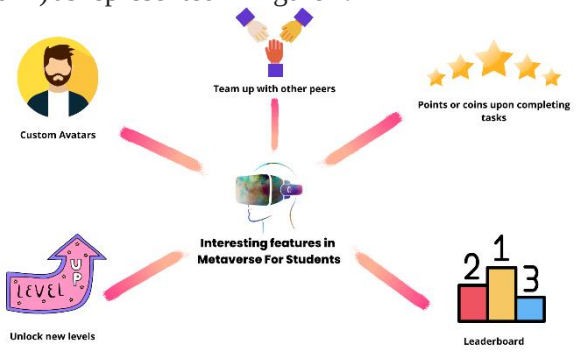

Fig. 7 : Representation of Few Interesting Features Which Provides the Students to Get Engaged in Metaverse Classrooms.

Students' interest in humanitarian causes can be sparked by using the metaverse in the class to raise awareness of societal issues including famine, pollution, and climate change. To help students understand how it impacts the locals, we may display the class a clip about the drought in Somalia. A mobile virtual reality (VR) game is suggested in a study by Estudante and Dietrich (2020) using the open source application Metaverse. Students are instructed to approach challenges in the method of physicists. Students can master chemical knowledge points by playing this game, which incorporates the elements of the periodic table, molar mass, chemical equilibrium reactions, and other concepts (Estudante & Dietrich, 2020). The Metaverse's platform can therefore be used to enhance students' learning determination and communication abilities in the framework of game-based learning.

Students can participate in extra - curricular activities like athletics and the arts virtually thanks to the metaverse. Similar to physical campus activities, students can participate in a variety of enjoyable activities including attending a music or math club (Yuyang Wang et al., 2022). Additionally, they can stroll across their online school without leaving their home.

Zepeto, Roblox, Gather.town, and Fortnite are examples of metaverse platforms that give a user experience based on a 3D graphic environment and a studio application that functions as a world construction tool. Users can customize the virtual world using the studio tool to construct their own virtual playgrounds (Park & Kim, 2022).

Roblox – Bringing Metaverse Education Closer To Reality

Roblox' is a Roblox Corporation-developed online gaming portal and game development system that allows users to design games and play games produced by other players (Hernández et al., 2022). Roblox makes use of both Lua and C++, a text-based scripting language (LaRouche, 2012). Teachers design gameplay levels and interactive tutorials for their pupils around the topics they want to educate using prebuilt templates in a Roblox educational experience (Xu et al., 2022). They then encourage students to play these Roblox levels (either in teams or alone), enabling them to grasp complicated topics (Rospigliosi, 2022). It's a framework that helps youngster's to begin with simple coding assignments,

providing a perfect foundation for video game development and creativity (Fornós et al., 2022). Coding can lead to a variety of skills and job opportunities, such as digital marketing, game creation, web development, as well as other forms of internet and software professions. In today's extremely tech-dependent environment, knowing coding can help the young generation to get a job in a variety of fields (Long, 2019). Many video games have puzzle-solving as a key component; you must consider strategy, resources, and approaches, among other things. Roblox, being one of those games that rely on trial and error, it helps the students to learn the logic in a very literal sense (Luhova, 2022). It is widely accepted that students learn best while they are having fun, and Roblox enables them to do just that (Meier et al., 2020) as represented in Figure 8. Roblox also has a strong educational bent, with over 300 educational institutions listed on its website. The platform was pushed particularly for its educational benefits during its recent introduction in China, the world's largest video gaming market (Kshetri, 2022).

Fig. 8 : Illustration of Various Features Available in Roblox Platform to Support Education.

Advantages of Metaverse In Education

Metaverse platform offers numerous advantages over traditional offline teaching practices such as by just setting specific restrictions in the virtual area, instructors will have absolute ownership over student engagement and will be strong enough to prevent abuse or isolate students for disciplinary reasons (Hwang & Chien, 2022). Conventional teaching venues' spatial and temporal boundaries are disrupted by the Edu-Metaverse. The classroom learning has transformed into an interactive and collaborative learning environment (Wu & Gao, 2022). Educators can develop customizable educational environments and settings depending on the material they are teaching. In the metaverse, pupils gain independence, individuality, and a creative mind which enhances their employment skills (Harborth, 2022).

Concerns In Metaverse For Education

Security and privacy problems are inextricably linked to the evolution of everything, and the metaverse is no exception. The security breach can cause loss of data, communications, scenario, and merchandise of the users (Yuntao Wang et al., 2022). Possible solutions based on privacy, machine learning, encrypting, copyrighting, blockchain, and other technologies are presented, all of which are user-centered and allow them to select individualized and suitable ways to solve these problems (Zhao et al., 2022). Apart from the security and privacy problems, social and mental problems linking to metaverse is been already questioned by the scientific community as depicted in Figure 9.

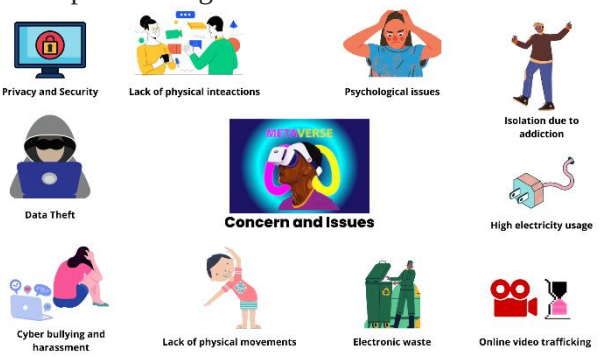

Fig. 9 : Representation of Various Concerns and Issues Associated With Use of Metaverse for Education.

Psychological concerns include loss of time in virtual world, aggressiveness, isolation disorders, virtual harassment and digital shelter. The societal concerns like increase in usage of electricity leading to climate crisis, online video trafficking and electronic wastes are also debated (Dutilleux & Chang, n.d.).

Conclusion

Metaverse may look like a science fiction to many but it’s a happening reality. Metaverse platforms are moving towards education industry as its application here is wide and have more potential. The tech giants like Facebook, Google, Microsoft, and Apple have already jumped into this field. Other gaming companies like Fortnite, Minecraft and Roblox has pushing it to greater heights in recent days. Roblox has taken it one step further by collaborating with more than 300 educational institutions to offer the

application of metaverse in the field of education. Like any innovation metaverse also share its own set of pros and cons which has to be debated in the days to come so that it gets shaped up. The one conclusion that needs to be accepted is that in near future the application of metaverse in education sector is inevitable. Hence, its best to get prepared for the future than trying to adapt to it as the earlier one will be more effective. So, we need more educationalists to do further research into this and prepare our future educators and learners to have an exciting experience in the world of metaverse.

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