The Importance of the Application of the Metaverse in Education

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Abstract

In the early 90's, and especially in some American universities, with the emergence of virtual reality, virtual environments and their manipulation began to be implemented, achieving important advances that have led to improvements in research through changes in the perception of the subject, modeling, communication processes and the development of 3D virtual classrooms.

These advances have led to the metaverse, as an environment where humans interact socially as avatars, and especially its application in the world of education in the fields of entertainment, tele-education, educational research, learning environments, etc.

According to technologists, this year will separate the thinkers from the builders, and then the technical advances of the last few years will produce the first steps this year in making the metaverse a reality. Advances will largely be attributed to ever-better graphics processing units (GPUs), photorealistic 3D engines, faster content generation through volumetric video and artificial intelligence, the increasing prevalence of cloud computing and 5G, as well as a more sophisticated and better understood blockchain infrastructure.

But from a human experience perspective, one development stands out above all others: extended reality (XR) technologies. These include virtual reality (VR), augmented reality (AR) and brain-computer interfaces (BCI), which together are positioned as the next computing platforms in their own right.

Keywords: metaverse, education, teaching methodologies, avatar, virtual classroom

1. Introduction

The buzzword in the most current environments of our society is the use of the word metaverse, which we have surely heard at some point. Mark Zuckerberg has decided to change the name of his company Facebook to Mega, and from that moment on, it has been almost impossible not to come across news or posts in networks mentioning this concept. A concept that, although not entirely new, until now was considered something rather futuristic. Apparently, other large technology companies such as Microsoft, Google are also betting heavily on this virtual world (Sanglier et al., 2020).

However, despite this flood of information about the word metaverse, Facebook and all its surroundings, there are still many people who do not know exactly what a metaverse is and what it can be used for (Sweeney, 2021).

This article aims to clarify the main doubts concerning the metaverse and its application to the educational environment mainly (Aguerrondo, 2014; Barrasa, 2022).

The Metaverse refers to the next generation of the Internet. It is a universe composed of a network of virtual environments in which you can have an immersive online experience. In this universe, users are represented by avatars and can interact with other people and elements that are also in the same environment. You could say that this new term is a new construction, an environment where you can live digitally (Recker et al., 2021).

To live digitally in this virtual space, a number of devices are needed, which will vary depending on the type of metaverse to which users connect. At present, there are simple versions, such as Second Life, which is presented as a virtual environment that can be accessed simply with a computer or smartphone with an internet connection.

It seems clear, however, that with the digital tools available today and the commitment of large technology companies, the metaverse is becoming something much more complex, which will offer absolutely immersive experiences and allow users to have an almost full digital life.

Using other tools such as virtual reality glasses (increasingly used) or augmented reality devices, a teleportation to a new world within the metaverse will be achieved. A world that, as seen by the big technology companies that are leading the way, will be a kind of alternative reality in which you will be able to do everything you do on a daily basis without having to move (for example, being able to be in the office interacting with your colleagues, without having to go through traffic jams or get on a train at rush hour).

2. Methods and Materials

2.1 Definition of Metaverse

Neal Stephenson, in his novel 'Snow Crash' in 1992 used for the first time the word 'metauniverse' to refer to a virtual world that his characters use using virtual reality helmets and where they interact with each other using all the services available in that world (video games, education, medicine, etc.).

Metaverse is an acronym of meta, which means transcendent, and verso, from the universe. It is the digital universe that emerges as a result of the combination of different technologies. The goal is the total integration of this digital universe with reality, so that all the activities and parameters of our physical world could be transferred to this virtual space (Ahumada et al., 2016; Gallopin, 2003).

2.2 The Use of the Metaverse

The Metaverse proposes to change the way we live today and the way we connect with family and friends.

The utilities of the metaverse are currently many, but in the near future, there will be many more (Donaldson, 2011). The first application is clearly focused on entertainment and, of course, video games. In fact, Minecraft or Fortnite could be considered as the beta version of the metaverse in this area.

In the workplace, applications are also sought after, especially after the pandemic by Covid-19, which changed the way many people work by introducing teleworking in a very general way in our society. One could imagine a virtual version of our workplace, where we communicate by video calls, interact with our colleagues and do our work, for example (Heim, 1998; Bostoen, 2021).

The metaverse could also be extremely useful in the healthcare sector, using it as virtual consultation services, disease treatment, applications for disabled people, meditation and stress management, virtual and augmented reality for training, etc.

2.3 Characteristics of the Metaverse

The Metaverse moves in a digital environment, and therefore, it must have the following characteristics:

a) The user must be able to communicate, interact and be under the spectrum of the term metaverse with his peers moving in the shared space.

b) b) The virtual world must be subject to the laws of physics to make it more real, and to other concepts of reality. Resources must be limited and the experience in first person.

c) The environment, like life, must be functioning at all times. This means that the data created by the users during their time in this virtual world must be saved and updated.

2.4 The Metaverse and It's Implication in Education

As in any relationship, it is risky to put one's hand in the fire, but in Classlife we consider that metaverses and education can be, at least, very good friends. And we are not the only ones. Many experts believe that this virtual universe has great potential in its application in education.

By creating a metaverse, an educational center can create a campus or a replica of its institution in a virtual version. With its classrooms, dining rooms, teachers' rooms... In this way, students, teachers and other employees of the center can communicate and interact in an agile way, as if they were there in person, also through video calls or videoconferences (Moolenar & Sleegers, 2015; Niemi & Isopahkala, 2015). This is perfect for institutions that are based on e-learning and offer all their training online, as it will allow them to humanize the educational experience, although it may sound contradictory.

Thus, thanks to metaverses, educational centers will be able to offer a 360 experience to students and workers and, of course, will have much more flexibility and adaptability to unforeseen events (Muijs, 2015).

The combination of all these elements, augmented and virtual reality, in the educational environment allows immersive learning as never before. It will be possible to take the gamification of lessons to another level, it will be possible to travel without moving to discover the history and culture of other places, students will be able to learn the laws of physics and enjoy science as they have never imagined (Sanglier, 2021).

2.5 Educational Leadership Training

Undoubtedly, a large number of specialists will be needed who are capable of developing all kinds of content for this new universe (Chapman et al., 2015; Earl & Katz, 2007). It seems to be true that 'he who starts walking first gets there first' but in the teaching field, it is very necessary to learn to unlearn in time, which means that not everything goes, and it will be necessary to choose the most appropriate for education to be better and learning methods to be more efficient (Chapman & Fullan, 2007; Feis & Devos, 2010).

It is true that in all areas of our society leaders are needed, in the field of education they are also necessary. The training of teachers in leadership is very important, the most important features of the educational leader are the ability to influence others without imposing their authority, the reflection of personal and professional values and the ability to convey an idea in an optimal way for the center and students (Bernal & Ibarrola, 2015; Boylan, 2016).

The manager/educational leader is one of the figures with the greatest responsibility in educational institutions at all levels, especially at the elementary and high school levels. Among its most important functions is decision making (Pautt, 2011; Scanlan et al., 2016; Schein, 1985). These decisions are related to the functioning, organization, operation and administration of the center. In addition to management and administrative responsibilities, the educational leader must take into account a decisive factor: the human factor (Schleicher, 2012).

The leader in educational environments is responsible for promoting the work and collaboration of all the people involved in learning: authorities, teachers, administrative employees and parents (Close, 2016; Covey, 2003).

This leader must inspire and intellectually stimulate the people with whom he collaborates, listening personally to each one of them and encouraging them to develop their best abilities for the benefit of the common goal (Garbanzo & Orozco, 2010; Matthews et al., 2008).

3. Discussion

Although it may seem incredible, it was in the 1990s that the first attempts were made to bring this new technology to the market and reach the end consumer, but it was immature because the structure created to maintain interrelationships with the different users was unstable. The Internet had not yet reached the solidity and development it has reached today, and could not offer the possibilities it does today (Castells, 2001).

In the market there are platforms and video games that have tried to replicate the metaverse, such as VRChat. In this case, users are allowed to enter virtual worlds wearing virtual reality helmets where they can interact and converse with other users wearing 3D avatars.

This new persistent virtual world is a three-dimensional, connected representation of the Internet where consumers are able to move between the different experiences of the physical real world and the virtual representation (Simoens et al., 2018; Tedesco, 2003).

The Metaverse poses another type of connection between users, it removes our bodies from the equation, and it is specifically at this point, when we have to raise the alarm, since the physical proximity between teacher and student is important, since education is not only done with the transmission of knowledge (Van der Merwe, 2021).

It is important to maintain contact with ourselves, because if we lose it, we would lose contact with the world, something similar to what the Irish philosopher Richard Kearney (1954) would say. There must be tactile connection, that is, nurture our sense of touch, the expansion of the metaverse could help to encourage the development of more somatosensory simulations (Rieckhof & Larsen, 2012; Rincón & Fullan, 2016). The human being longs for such mundane things as a hug (and more so in these times), a caress, to feel that one is alive...and this, for now the metaverse cannot give us.

The metaverse and its environment will soon become a 'reality' if it is not already. Society, and with it education, is already opening up to this new virtual world, through specialized courses in the metaverse by universities, for example, the Complutense University of Madrid, which are working to evolve at the same pace as its environment.

Work is already underway to unify the all-in-one educational management platforms with the metaverse, and soon, the connection between both worlds will be a real reality so that centers working together can offer the best learning experience to their students.

It seems that post-pandemic or post-covid education has left us with a broader educational framework, where before we had a face-to-face education as a priority, now we have a dual face-to-face education (face-to-face and on-line) and this has made the educational world rethink where to go.

We have to assume that we are facing a new responsibility, perhaps wider than before because the educational environment and methodologies have increased in some way to reach more students and teachers. Now, with the new systems introduced, for example, the TEAMS tool, you can interact with students and teachers live, which undoubtedly leads us to perform a multitude of tasks, and to a greater enrichment of all (Furht, 2008). The possible distance between everyone has been shortened and a window has been opened to new educational possibilities.

In this new scenario, in this new virtual world, there is more room for the metaverse to bring institutions, teachers and students closer together while maintaining the standards demanded by the new digital world. However, we must not forget the priorities of demand and participation of students and their learning experience.

On the other hand, and as an interesting topic for discussion, it is estimated that in the metaverse, the virtual world that is being built, there will be some cyber-attacks, because virtual reality, by itself, could facilitate the conditions for them to occur on a more regular basis. Among them, the following stand out as the most worrying:

- Distributed Denial of Service (DDoS). This type of cyber-attack collapses the web server, because it receives more service requests than it can handle to maintain its functionality. The metaverse means an endless number of new target servers from which they will be able to extract more revenue than they are currently getting.

- Spoofing. It can be seen today how technological development is somewhat facilitating, and at the same time preventing, this type of cyber-attack, for example, with the increasingly realistic DeepFakes. The metaverse could represent a breeding ground for new forms of impersonation due to the use of avatars, in turn affecting other related risks, such as grooming.

- Ransomware. The famous ransomware viruses could be a major problem in the metaverse, where users are custodians of virtual goods of great economic value, thus becoming favorable targets for this cyber-attack.

There are other more specific questions to be addressed, such as whether a specific "cyber legality" will be created for the metaverse, or whether cybersecurity solutions will be implemented through a "digital police".

For the time being, based on what is known, it can be concluded that the risk analyses carried out on the metaverse must also take into account the Advanced Persistent Threats (APTs) that may occur, and that the application of cyber-intelligence methods is increasingly necessary for the development of a more prospective cybersecurity (Nisa, 2016; Ondrejka, 2004).

4. Conclusions

Technology has evolved so fast and so much, that it is no longer rare to think about the arrival of autonomous cars (without steering wheel and without control instrumentation) or space travel that are already slowly being commercialized. Therefore, thinking about Metaverses is no longer the stuff of science fiction, as you have limited versions about them on various gaming platforms.

In addition, it should be noted that there are several companies that are developing their own Metaverses or applications designed for this new technology. And many investors are investing millions of dollars to develop the technology, and of course, benefit from a new economy (Porush, 1998; Ray, 2016).

In today's education, all teachers and students use various digital tools in their daily lives: for online classes, to share materials or to take tests, among other activities. In some cases, advanced solutions such as the use of augmented reality in the classroom, which allows students to access virtual content during class through augmented reality glasses, are already being used.

This diversity of technologies presents a practical problem. They are often incompatible tools, which makes it difficult to transfer content and data in an agile way.

The metaverse will facilitate the integration within the educational experience of practices in virtual environments in which student and teacher can interact as in a face-to-face classroom. This application of virtual reality is

already being used successfully in the teaching of health sciences, for example, in the performance of virtual surgery or in flight simulators (Touraine, 2005).

The union of various technologies such as virtual reality, metaverse and artificial intelligence will allow the contents to be personalized for each student and will make it easier for the teacher to monitor and evaluate them. Everything points to the fact that the metaverse will give an important boost to the integration of new technologies in the field of education.

However, the loss of 'tactile' contact between the student and the teacher, in addition to the great technological advances, not always within the reach of everyone and not always available to all educational centers, leads us to think that not everything will be advantages.

It is feared that the metaverse may bring new habits that will negatively affect the culture and relationships in the real world, and that is undoubtedly one of the major problems that society faces with the Metaverse.

We have photo apps with filters that retouch and enhance the features of our face to make us look better and be seen better by the networks. We travel to a country or a particular place because it has gone viral on an Instagram profile. We eat at a restaurant because it has the best recommendations. What can now be seen on Instagram, Tik Tok, Youtube is what used to be seen in magazines and newspapers. Or even more in the old days, it was the so-called 'word of mouth' recommendations (Martínez, 2005). Nowadays, we live in such a connected and controlled world that even our decisions seem to be made by others, and not by our own common sense.

Another problem that has also affected companies such as Facebook, now Meta, Google or Apple is privacy and cybersecurity as discussed (Lamarca, 2006; Lee et al., 2021).

The creation of the metaverse will change our way of life, and will have very significant consequences in the area of Cybersecurity. Will it be worth it? It will not be possible to know for sure until the experience is normalized, but it will be possible to analyze which aspects are the most important so far. Cyber intelligence methodologies should be developed to help protect the integrity of virtual world developments.

It is often said that, in technology, the limit is the imagination. With the advent of the metaverse we can add a new dimension to our ideas: everyone can create new worlds and move all our technology from 2D to 3D.

The Metaverse in the short term: augmented reality to enhance - not replace - the human experience. Digital technology should not compete with physical reality, as most people do not enjoy prolonged experiences within virtual worlds. The metaverse should enhance, not replace, human experiences.

The Metaverse in the long term: brain-computer interfaces, the "ultimate platform". Perhaps the most far-reaching vision of the metaverse is that of brain-computer interfaces (BCI). Today, all RX models are based on traditional displays and control systems, although some devices have also worked with the senses of touch and smell. BCIs aim to completely replace displays and physical hardware. Technologies such as Neuralink require neurosurgery to implant the devices into the brain, an idea that both intrigues and discourages many potential consumers. Researchers have also used neural interfaces to restore the ability to speak and write to people who have suffered speech loss.

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