METAVERSE, A SPACE, THE FUTURE: NEWSPATIAL PARADIGMS AND THE VIRTUAL AS A PLACE OF TEACHING

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ABSTRACT

The change in the dynamics of living, driven by the pandemic, opens doors to the possibility of immersion in the metaverse through forms of teaching. With the evolution of technology and the innovation of the internet, we see the need and the range of possibilities that educational fields have when exploring and making use of the virtual world that is approaching. It is important to emphasize that good use of this virtual medium allows us to spread ideas and apply them to various environments that become of common interest, such as classrooms. It is necessary to follow the evolution of the metaverse and face the unknown, to see if this transformation is in fact appropriate.

Keywords: *cyberspace, technology, education, virtual room.*

1 INTRODUCTION

The need for social isolation due to the COVID-19 pandemic has brought rapid changes in all sectors. Education was no different. With the goal of not paralyzing studies, different dynamics have been adopted in the educational sphere, to build what has been called "remote learning", teaching based on the intensive use of *online tools,* that had not yet been put to the test, such as video call applications, video production tools for students and teachers, the use of *websites* for collective construction, both textual and imagery, among other applications and programs. The virtual environment, made up of all these tools and applications, made it possible to continue teaching throughout this period. More than that, it built a new educational paradigm that, even with the return of face-to-face classes, changed the shape of

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education in the world.

In the year 2021, another event is taking place with the potential to evolve and expand teaching relationships that have already been changed by the pandemic. The former conglomerate *Facebook,* driven by the isolation of the pandemic, changes its name to Meta, a word that refers to metaverse and means a new use and visualization of the internet. This American technology and social media conglomerate, one of the most valuable companies in the world and considered to be one of the five largest technology companies, has set its sights on developing the metaverse in the near future. The idea of the metaverse, popularized in 1992 by Neal Stephenson in the novel *"Snow Crash",* shows a futuristic scenario where access to technology allows a virtual world *online* and in three dimensions, breaking the old non-spatial paradigms. While in the real world we are limited by different barriers, the metaverse proposes to eliminate them between the real and the virtual, becoming an environment where human beings interact socially and economically, through avatars with physical characteristics similar to the real world, but without spatial or gravitational limitations.

While the pandemic changes the dynamics of the experience, the metaverse emerges as a possibility for ever greater immersion, opening up space and potential also in the forms of teaching. Just like games that offer a high degree of freedom in experiences, the metaverse can offer professional tools for producing and expanding the virtual world. The creation of the metaverse will involve many professionals who must be prepared. Pioneers in the field guarantee a range of future possibilities that can be highly profitable and have overwhelming potential. It is necessary to broaden the discussion before its implementation. The aim of this exploratory research is to understand the metaverse, its first practical experiences, the development of this new paradigm, above all its implications and its potential for establishing virtual teaching spaces.

2 TECHNOLOGICAL EVOLUTION

In order to conceptualize the metaverse, it is important to trace a history of the technological evolution that enables its development process.

According to Gabriel (2022), in his book Artificial Intelligence - From Zero to the

Metaverse, artificial beings have been incorporated into the human imagination since ancient times, as in Greek mythology, where Hephaestus creates an automaton to work in his workshop. In the Middle Ages, Ramon Llull proposed a combinatorial language so that knowledge could have a universal language. Works such as The Flute Player (1737) and The Digesting Duck (1738), created by the Frenchman Jacques de Vaucanson, became watersheds between fiction and reality. In 1936, Alan Turing proposed a “universal machine”, a milestone for the foundation of Artificial Intelligence (AI). The 1940s saw the emergence of artificial neural networks and the first *Macy Cybernetics Conference,* which sought to discuss interdisciplinary scientific topics on cybernetics. The same decade saw the appearance of the first machine, *Electronic Numerical Integrator and Computer,* which brought Alan Turing’s ideas to life as a technological legacy of the Second World War. In 1952, the first self-taught chess program was created by scientist Arthur Samuel. In 1967, the first anthropomorphic walking robot was created. Paul Werbos created the algorithm responsible for learning artificial neural networks in 1974, which now contributes to Convolutional Networks, classifying images. However, from the 1970s to the 1990s, expectations fell and interest in investing in the area diminished, known as the “Winter of AI”.

The year 1997 saw the conquest of new planets through robotics, with the launch of the Sojourner robot on Mars, the first to collect information. At the end of the century, Larry Page and Sergey Brin developed the Google search engine, one of the most valuable brands in the world today. Gabriel (2022) points out that, in 2011, a robot was created that “thinks”, that solves problems without the need for supervision and an unprecedented system of perception of surroundings. This is possible thanks to the neural network presented by Osamu Hasegawa in 2006. In addition, Osamu develops a robot based on *SOINN,* which has developed functions for which it was not programmed. In the same year, the first version of Siri, Apple’s voice assistant, was launched.

The author warns that, since then, there has been an acceleration in the advances of technology and its dissemination in an impactful way that raises questions. One of the most recent controversial AI creations has been Bina48, which aims to be a mental clone identical to a person, and which presupposes transforming human beings into immortals through technology, by *uploading* the mind into an

artificial structure. In 2015 Alexa was launched by *Amazon,* a home voice assistant that interacts via voice to perform various functions. In 2016, with humanity closer, Google is presenting AI neural networks that are learning to be creative, providing applications with great educational and social potential.

Gabriel (2022) points out that evolution continues, and with the COVID-19 pandemic, AI and robots have been introduced more and more into people's lives, further driving digital innovations to bypass human contact and optimize processes. In quantum computing, in November 2021, the *Eagle,* computer was developed by IBM53 for Elon Musk, used in his business applications, with performances that surpass traditional supercomputers. In 2020, *OpenAI* created *GPT-3:54,* the third generation of natural language processing (NLP), which was considered an important milestone in digital transformations around the world, which has the capacity to develop different types of texts, including computer programming codes.

According to Gabriel (2022), Artificial Intelligence will take us to new heights, reconfigure and restructure our reality, improve our quality of life and promote a global economic race. Its accelerated pace transforms human beings into a new species, the *Homo digitalis.* Before AI, the tools created depended on human action to function. With AI, tools learn, create and become intuitive without human intervention. This results in solutions beyond human capacity and changes every aspect of life. AI offers more productivity, precision and speed. However, its inappropriate use can lead to numerous harms, such as power struggles, inequality and the lack of human sustainability.

Until the beginning of the 20th century, the human life cycle was always longer than that of a technology. Now, over the course of a lifetime we have experienced countless technological disruptions. The author considers that technology will change much more in the next 20 years than it has in the last 500 years and emphasizes the importance of preparing for this process.

Also according to Gabriel (2022), the real disruptive technologies that act by restructuring the environment, relationships and, in general, the world, as a way of reproducing the functions of a human being more efficiently are: firstly AI, which refers to the ability of machines to imitate the functions of the human mind, with behavior "intelligent". Secondly, the IoT (Internet of Things) acting as our senses, transmitting sensory information. Thirdly, 5G, which resembles the nervous system,

transmitting streams of information. Fourthly, *Big Data,* which behaves like human memory, which feeds the brain to become intelligence. Fifthly, the *Blockchain* which allows different universes to exchange information. Sixthly, robotics as a material body for interaction in the environment. Seventhly, nanotechnology, and lastly, 3D printing.

3 THE METAVERSE

According to BBC News British Broadcasting Corporation), the word “meta” comes from the Greek meaning “beyond”. In short, it can be described as a virtual reality (beyond the universe), but it’s much more than that.

With the strengthening of globalization in the 1990s, the internet became popular and the digital universe gained relevance. According to Pase (2022), on the Frontiers website, the idea of the metaverse became popular in 1992, in the novel *“Snow Crash”* by Neal Stephenson, which describes a future in which privileged people have access to a three-dimensional virtual world. In 1999, the movie “Matrix” presents a rupture between reality and illusion, between consciousness and unconsciousness, with a hacker who seeks an escape from reality.

For the author Gabriel (2022), the numerous technological developments, especially blockchain and AI technologies, enable the processes and transactions that make up the metaverse. Gradually, various dimensions of the metaverse were conquered, and all of them are experienced and disseminated in our physical reality, in 1D with texts, images, audios, etc., 2D with videoconferences, and 3D with virtual realities, among others. It allows us to coexist in a much wider range of simultaneous realities, with the possibility of hybrid, fluid and integrated transactions, a real way of breaking down the barriers between the physical and the digital, making the social fabric more complex, diverse and interconnected.

Longo and Tavares (2022) state that games are the initial stage of the metaverse, with an immersive experience, but beyond games, they propose incorporating the most varied contexts of socializing, with ways of replicating a life, routine and relationships in the digital universe, making it possible to build a house, a walk, shopping and entertainment, without the need for rigidity in the acts, even allowing the game itself within this digital universe. For the authors, social networks were responsible for training the metaverse, making people objects of desire, being

whatever they wanted to be independent of reality. What's more, they have transformed the way we see the world. According to the timeline proposed by Longo and Tavares (2022), Pokémon GO appeared in 2016, mixing reality with the virtual world. Then, in 2017, *Fortnite,* was launched, bringing users closer to the experiences of the metaverse and, in 2020, promoting the first show within that world.

According to Schlemmer and Backes (2008), the metaverse is a technology materialized by 3D Virtual Digital Worlds, enhanced by the interaction of avatars, the best-known example of which is *Second Life.* Guimarães et al. (2022) explain that virtual reality is like some types of games, for example Minecraft, The Sims etc., while augmented reality seeks to include what is digital in the real environment, the metaverse being the integration of the two, through augmented reality glasses or special equipment, which provide experiences close to life, but wherever and whenever we want. On the other hand, Pereira; Almeida (2023) emphasizes that the metaverse may not reach exactly the expected proportion in terms of a transformation.

According to the E-Commerce Brasil portal, in records made by *Comscore,* as of October 2021 the term reached 2300% more mentions. Between 2020 and 2022, when analyzing the topics discussed related to the metaverse, it was concluded that 39% of the subjects were related to *Facebook/Meta,* 19% about virtual reality, 15% to companies and businesses and 11% to *NFTs.*

Samartini (2022), CEO of *Yssy & CO,* states that the metaverse is in its first stage, as an "innovation trigger", using a methodology for analyzing the growth cycle of new technologies, developed by the Gartner Institute *(Hype Cycle),* which is divided into five subsequent stages: 1 - Innovation Trigger, when companies create prototypes and tools to test on the market, and speculation about the subject arises; 2 - Peak of Expectations, when there are optimistic projections about its potential; 3 - Abyss of Disillusionment, when the technology faces challenges and obstacles; 4 - Ramp of Enlightenment, when the challenges are overcome and its real benefits understood; and 5 - Plateau of Productivity, when the technology reaches stability.

The next crucial step is interoperability between the worlds, so that there is a seamless experience between the platforms. According to Longo and Tavares (2022), Zuckerberg is seeking to make this integration possible through a common

language for all via a protocol. In addition, possibilities for sensation are already being developed through *wearables,* with designs for insertion in glasses and holograms that transmit the physical sensation of touch and warmth in a natural way, without the use of gloves. Only the taste has not yet been replicated in the metaverse. Companies from different sectors, such as *Housi,* which has built its own building in the metaverse, at *Decentraland,* the *MedRoom,* which has created a virtual universe for the purpose of teaching practical medicine and Upper's Escola do Metaverso, are already exploring this opportunity in Brazil.

4 THE METAVERSE AND PEDAGOGICAL PRACTICE

According to Schlemmer and Backes (2008), the *"Tamagochis"* were the first representations of virtual lives that needed care to survive that appeared in the face-to-face world, back in 1996. Although its emergence was uncomfortable for parents and some teachers, it enabled new ideas to be used in the classroom by teachers who thought differently. Such teachers have carried out interesting learning projects in the classroom, teaching about the needs and importance of caring for human life through the needs of *"Tamagochi",* still other teachers have used the "pet" to present mathematical questions through the time between the needs of the virtual being. Of course, there were concerns about the possible effects on interaction with technology, such as believing that children and adolescents could become confused between the real and virtual worlds. However, it was noted that this was not the case; the presentation of the technology showed that these were two worlds with different properties and rules. According to the author, the use of technology associated with teaching methodologies has the potential to improve students' learning and awareness, developing autonomy, collaboration and mutual respect, among others.

As another example, the author cites *Second Life,* which, being a virtual world, has a reality, but one that relates to virtuality, enhanced by avatars that promote a sense of belonging and immersion in the 3D environment, an experience that is different from a *WEB.*page. As a result, many universities have appropriated this technology for simulations in order to investigate social relationships, history, learning disabilities, skills, communicating with other avatars through textual language, building spaces that represent their knowledge through graphic language, using oral language in conversations, among others.

According to Schlemmer and Backes (2008), the spaces built in *Second Life,* by *GP e-du,* aim to be educational in virtual digital urban planning, bringing concepts related to ecology, efficient use of natural resources, experimentation with the possibilities of graphic construction, etc., seeking to create not only real spaces, but also imaginary spaces. The author criticizes educational institutions that use the same traditional methodologies of open courses for the *Second Life*. He also points out that it is not the fact of using innovative technologies that guarantees innovation, because, “innovation lies in the creative way of using it”. We need to understand that learning takes place through the subject’s practice with the object of knowledge, and that the 3D environment, or metaverse, can be a potential link in this transfer of knowledge.

According to Azevedo (2022), Professor Raphael Chaia held a class on criminal law in the metaverse on May 25, 2022. The lesson took place in *AltspaceVR,* with the students accessing it via their desktop and the teacher using Meta’s *Oculus Quest 2,* to give the lesson.

According to Pereira (2022), the private Virtual Campus University of the Technological and Higher Studies Institute of Monterrey, Mexico, created its own metaverse, where personalized avatars were teachers and students, with common spaces such as living areas, sports sections, and even a beach. In this metaverse the “Alternative Installations and Sessions”class took place.

Pereira (2022) also says that *Roblox Studio* allows the creation of maps and games in a free and intuitive way. As far as education is concerned, the author suggests ideas such as exploring maps, carrying out missions to acquire *skins,* accessories, and taking car rides on rivers, although there is no recipe for how to apply the metaverse to teaching, but it can be combined with the teacher’s initiative. Furthermore, in *Roblox* the currency used *(Robux)* can be obtained with real money, which enables sales on the platform. From this, the author suggests that countless projects involving mathematics can emerge, through the monetary system, values, percentages, problem situations and even algorithms.

5 HYBRID TEACHING

The previous section presented the constant change in society due to

technological evolution and the search for improvement. Associated with this is the need to adapt users and environments. One of the areas most revolutionized by the metaverse is education, as it enables the humanization and practice of teaching (Longo; Tavares, 2022).

Understanding the many needs of a classroom is no simple task and education gains new possibilities with the use of the metaverse. However, due to the difficulties faced in making full use of the metaverse, the authors propose that approaching students with hybrid teaching, combining the use of virtual and face-to-face classes, could be a way forward, a modern perspective to provide more complete, dynamic, personalized and more socially engaged teaching in view of the social inequality in today's environment Guimarães et al (2022). Change requires investment, and more than that, a restructuring of teaching methods, but it also promotes the solidification of teaching and can be adjusted and optimized using existing resources. Everything implies an evolution from traditional education to a more flexible and adaptive model.

Schlemmer and Backes (2008) emphasize the importance of technological appropriation on the part of teachers in their training, as well as the need to understand what it means to be a virtual student. Successful hybrid teaching includes choosing the right tools, teacher training and technical support to ensure that the *online* learning environment runs smoothly and efficiently. Digital communication skills are required. Teachers should have access to regular updates and professional development opportunities related to hybrid teaching and educational technologies.

It is important to note that there are studies that typify teachers' skills and difficulties in ICT (Information and Communication Technology). According to a "Mapping Teachers' Digital Limitations During Remote Education" carried out by the authors Junior and Novello (2021), which addresses the concept of Digital Limitations of the shift to remote education driven by the pandemic, overcoming limitations in access to ICTs is a requirement for the effective application of technology. The study identified concerns in several areas, such as: limited knowledge of tools; issues related to response times; technical challenges and lack of familiarity with tools; ergonomic aspects; inadequacy of computers and lack of adequate infrastructure. In addition, the study presents challenges associated with teacher training, such as intellectual property, their difficulties in managing the boundary between work and personal life, and family dynamics. Points that must be met by the educational

institution in order to carry out its work.

The school must be prepared for the future. In this respect, the metaverse can improve the quality of learning through the possibilities of immersive experiences, enabling interactions that would be unimaginable if thought of only in the physical world (Pereira, 2022). It is necessary to have well-defined objectives, to understand which subjects are best dealt with *online,* and which can be dealt with face-to-face. After the classroom lessons, students can do reinforcement activities *online,* reviews, or even discuss the subjects related to the lesson.

Through this transformation, the teacher will be able to stimulate curiosity, forming critical and questioning students. As well as being inclusive, it gives the user the experience of acting in any scenario, completely transforms the way they study, and broadens the entire educational and cultural experience through visits to museums and libraries, among other diverse possibilities (Longo; Tavares, 2022).

The National Common Core Curriculum (2018), in the context of basic education in Brazil, highlights the importance of developing socio-emotional skills, critical thinking and creativity. It recognizes that education must go further, that it must prepare students for life in society; it emphasizes the need to value knowledge, and the integration of technology into education, recognizing that students need to have digital skills. It emphasizes the importance of students taking a leading role in their own learning process, encouraging autonomy and the ability to make informed decisions, as well as being able to adapt to change. To achieve this, it is necessary to ensure that students have adequate access to technology and connectivity to effectively participate in *online*learning, equal access to learning opportunities, regardless of their socio-economic or geographical situation, creating a culture of innovation at school, encouraging new approaches and technologies.

It is possible to create partnerships with external organizations, such as educational technology companies or higher education institutions, which can offer additional resources and expertise. Change in education will not happen overnight, but is an ongoing process that requires the commitment of educators, schools and education systems to prepare students for the future. As technology plays an increasingly important role in our lives, students should have solid technology skills, including digital literacy, online safety and responsible use.

6 CONCLUSION

That said, the term metaverse is still undergoing a transformation. Although it is still a project in development, technological evolution, especially in artificial intelligence, the internet of things, 5G and other areas, has driven the development of the metaverse. The COVID-19 pandemic has accelerated the digital transformation in education, leading to the emergence of remote learning and the need to adapt to new technologies. In this context, the concept of the metaverse is gaining prominence as a new technological paradigm that is shaping the way we interact, learn and live. Its main advantage is that it makes teaching more powerful and immersive for the student, since the experiences explained in theory can be experienced in practice through avatars. What's more, they are learning tools that can be applied to all areas of education.

The metaverse is in its early stages, with games playing an important role as immersive experiences. It should also be remembered that its application goes beyond entertainment. Among the many reasons for this proposal, we highlight the fact that metaverse technology offers unique educational possibilities, allowing simulations, social interactions, experimentation and knowledge building in ways that were previously unthinkable. Incorporating these tools into all educational institutions, both public and private, is one of the biggest challenges. However, there is a need to be receptive to this gradual migration and not become complacent, since the appropriation of technology is fundamental as a support for learning, helping in the construction of knowledge and providing more complete experiences, even going beyond issues such as distance. Teachers and educational institutions are exploring the potential of the metaverse to create innovative educational environments. It's important to emphasize that innovation isn't just in the use of technology, but in the creative way in which it is applied.

Therefore, the use of the metaverse in education is promising, offering opportunities to transform the way students learn and interact. It is essential to find a balance between innovation and pedagogical methodology in a solid way, introducing students to a much more digital and interconnected future. As technology evolves and interoperability between platforms improves, it is essential that educators, institutions and students are prepared to embrace this transformation and exploit the

educational potential of the metaverse. To this end, this article seeks to contribute to future research related to the subject, such as the social impact of the metaverse, its digital inclusion, the user experience, among other ways of approaching the subject.

Webb (2023) states that we should view technology with caution, since everything in this area is in dispute. Although discussions about the metaverse have cooled in recent months, resembling the 'winter of AI's", there is a continuous expansion of experiences that lead to the construction of this universe, its construction takes time. In short, we shouldn't lose focus of the current reality, which should use the small samples of what the metaverse could become, such as augmented reality, artificial intelligence as support, among others, working together rather than confronting.

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