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The future of Learning Drawing: exploring the Metaverse in Education

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Abstract. This study explores the historical development, architecture, and potential future applications of the Metaverse in drawing education. Examining its transformative role, the article focuses on 3D modeling, virtual reality, and collaboration, highlighting origins from Neal Stephenson's "Snow Crash" and its cinematic interpretations. The paper analyzes the growing interest, evidenced by a surge in Metaverse publications. It discusses the Metaverse's role in social media evolution, emphasizing immersive experiences and authentic connections. Facebook's rebranding as "Meta" underscores industry shifts. In design, the Metaverse aids 3D model creation shared on social media for feedback. The study advocates for immersive learning experiences and explores university initiatives. With COVID-19 underscoring remote learning limitations, the paper proposes the Metaverse as a solution, envisioning its potential for laboratory simulations, historical site visits, remote collaboration, and personalized learning. The Metaverse is positioned to revolutionize education, making it more accessible, engaging, effective, and innovative.

Keywords: Education, Metaverse, Digitalization

1 Introduction

The Metaverse is the biggest gamble launched by the tech world in recent years. This study discusses the factors that have influenced the historical development of the Metaverse, the architecture of the Metaverse, and the possible future use of the Metaverse in the field of drawing education [1].

A virtual space in which differences with reality become almost imperceptible: this is the Metaverse, where it is possible to work, meet, and perhaps even teach drawing techniques [2] [3] (Figure 1).

The article aims to understand how the Metaverse can fit into the world of education, pointing out the strengths and weaknesses of its use. This study analyzed the few sources available in the literature on this topic, trying to understand how Metaverse can add a new dimension to the field of educational technologies.

A search was performed on Scopus, using the word "Metaverse" in the keyword filters, and 422 publications from 2006 were identified. In 2006, the number of publications with the keyword "Metaverse" was 1, while the number increased to as many as 329 in 2022. However, only 45 of the 422 publications had "educational" as an additional keyword.

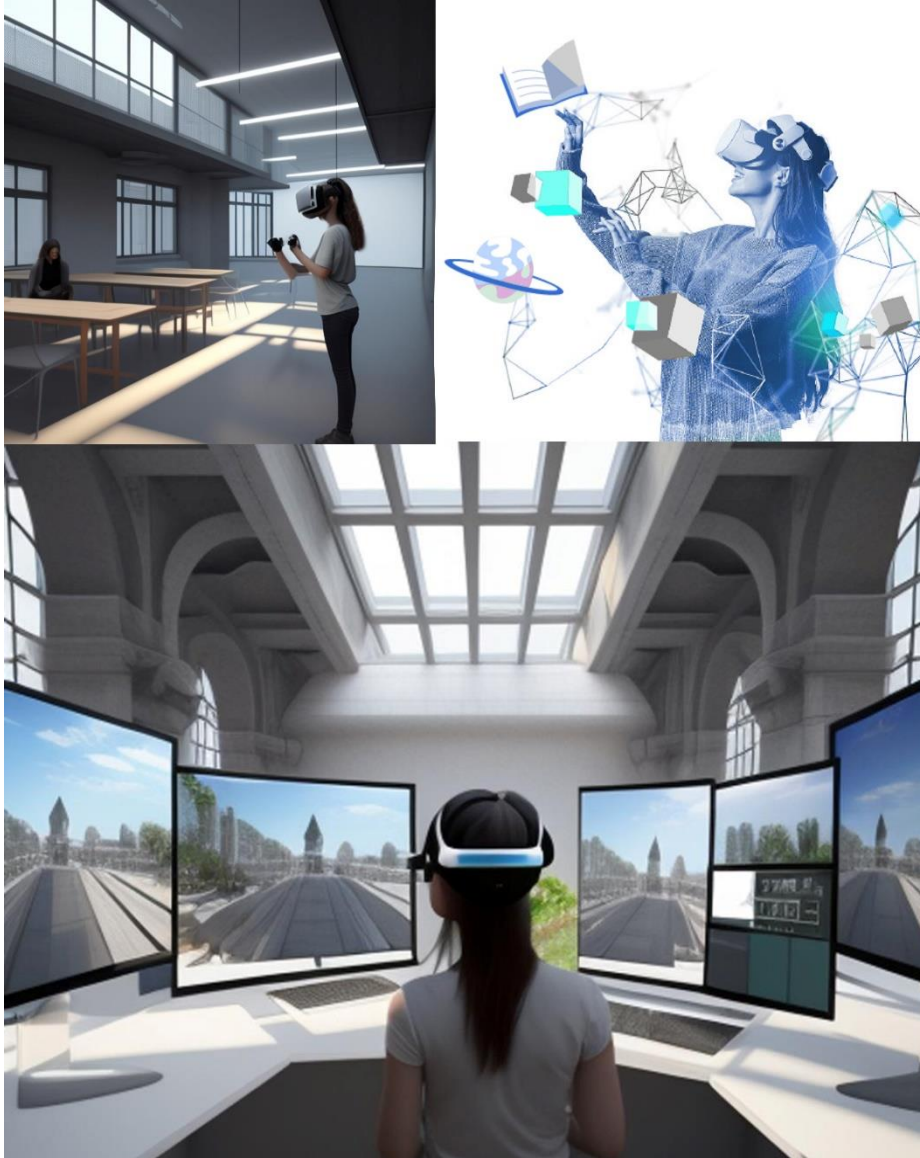


Fig. 1. Metaverse use scenario in the field of education.

2 Origins and evolution

The word "Metaverse" is composed of the Greek prefix "Meta", meaning "beyond", and the English word "universe". The term "Metaverse" first appeared in 1992 as part of the novel by American Neal Stephenson, titled "Snow Crash" [4] (Figure 2 - a).

In this cyberpunk novel, set in Los Angeles, humans could freely access a 3D space that reflected the real world through avatars that could interact with each other.

In the following years, the Metaverse concept also saw different interpretations in the world of science fiction movies.

In 1999 with the epochal film *Matrix* written and directed by the Wachowskis (Figure 2 - b), then revived in 2021 with *Matrix Resurrections*, the cinematic work that puts cyberpunk fiction into images at its best; in the same year the film *The Thirteenth Floor* a science fiction noir film written and directed by Josef Rusnak (Figure 2 - c). Or in films of later date such as *Avatar* in 2009, a science fiction kolossal by James Cameron (Figure 2 - d); *Inception* in 2010, written and directed by Christopher Nolan (Figure 2 - e). The 2017 film "The Circle" (Figure 2 - f) is a dramatic movie directed by James Ponsoldt, telling the story of Mae Holland, a young woman hired by The Circle, a technological company developing a new operating system that allows people to share every aspect of their lives online. In the film, Mae explores the potential of the Metaverse for education.

The Circle creates a virtual reality experience called "The Learning Sphere", enabling students to learn in an engaging and personalized manner. The Learning Sphere can be used to study various subjects, from history to mathematics. The narrative then shifts to Ernest Cline's novel titled "Ready Player One", which inspired the 2018 film directed by Steven Spielberg (Figure 2 - g).

This science fiction film follows the story of Wade Watts, a teenager living in a dystopian world in 2045. Wade spends his days in the OASIS, a shared virtual world where people can escape from reality. In the OASIS, Wade engages in an epic treasure hunt that could lead him to immense wealth. The film explores the potential of the Metaverse for education, providing students in the OASIS access to a wide range of educational resources, including lessons, simulations, and laboratories. The Metaverse can make learning more engaging and effective, allowing students to experience the world in a new way.

From 2022, there is the film "Adam Project" (2022), a science fiction movie directed by Shawn Levy (Figure 2 - h), which narrates the story of Adam Reed, a fighter pilot who travels back in time to meet his 12-year-old self. In the film, the young Adam is instructed by the 40-year-old Adam using a virtual reality simulator. The simulator allows Adam to experience different scenarios and learn from his mistakes.

The virtual reality simulator serves as an example of how virtual reality can be utilized to personalize learning and provide immediate feedback [5].

It is clear, therefore, that the development of the Metaverse has occurred in the past decade with the rapid advancement of emerging technologies, three-dimensional photography, virtual reality, augmented reality and wearable devices [6].

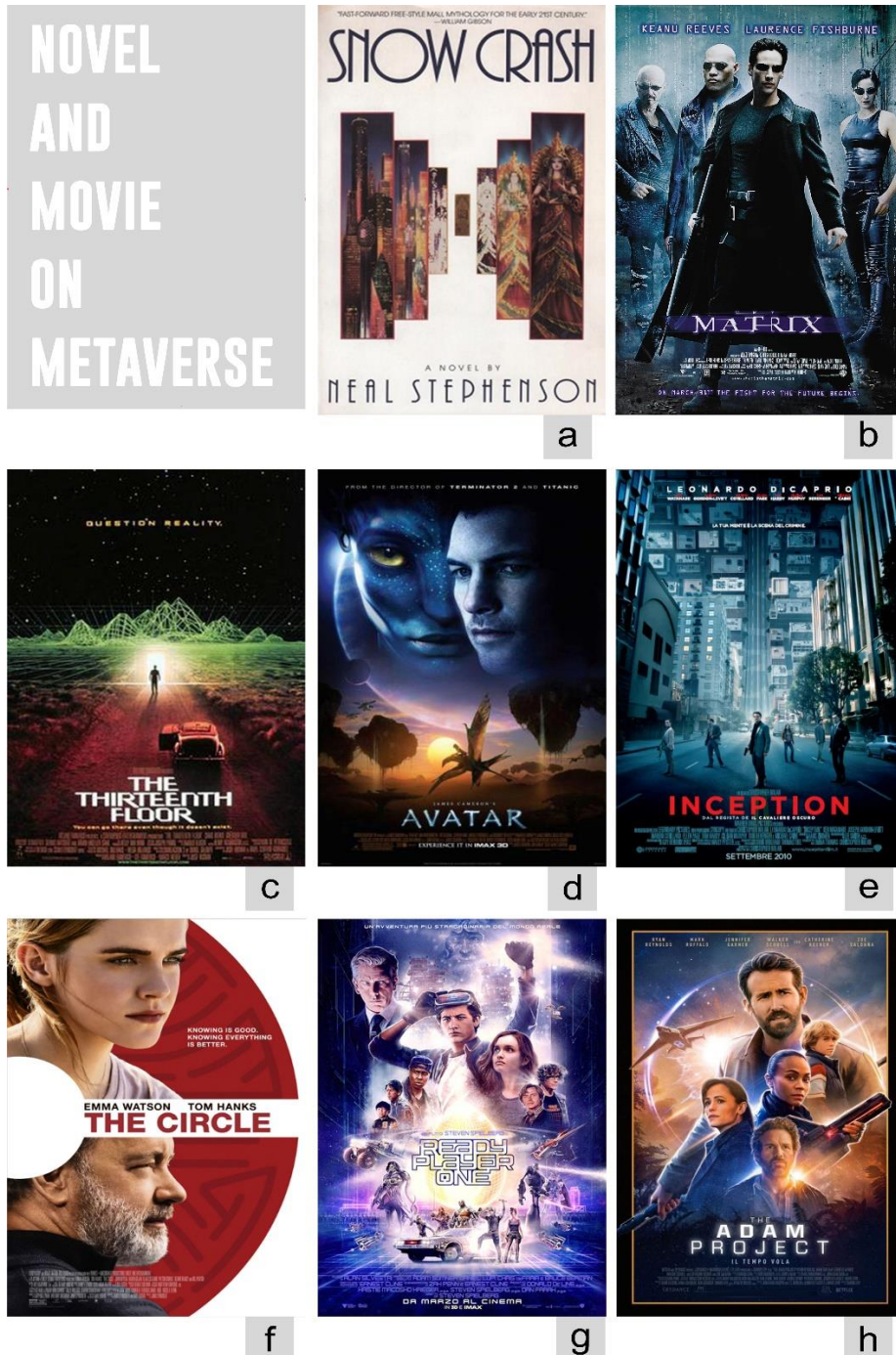


Fig. 2. a: Cover of the book "Snow Crash"; Movie poster - b: "Matrix"; c: "The Thirteenth Floor"; d: "Avatar"; e: "Inception"; f: "The Circle"; g: "Ready Player One"; h: "Adam project".

A major contribution in moving closer to the Metaverse is being made by gaming platforms, which in recent years embedded in virtual reality create an illusion for a realistic experience using 3D images, VR headsets, full-screen displays, and rooms with sensory features of scents and tactile sensations. Demonstrating this, the sandbox game Roblox has been regarded as an early Metaverse.

Roblox is an MMOG (massively multiplayer online game) genre video game developed and published by Roblox Corporation in 2006. In the game, people can create their own virtual worlds through the Lua Script programming language (Figure 3).

Roblox's "imagination platform" allows users of all ages to imagine and create immersive 3D worlds.

Users, once they have created their own avatar, are provided with a virtual toolbox, the "Roblox Studio," which is useful in the construction of their own world. Last but not least, the development trend direction that social networks are adopting. Whether inspired by consequences of the recently pandemic or simply the byproduct of a generation spending an increasing amount of time online, everyone is looking for new ways to evolve their digital interactions [7].



Fig. 3. Game Roblox by Roblox Corporation.

3 Metaverse and social media

The Metaverse and social media are two rapidly evolving technologies with the potential to change the way we interact with the world. The Metaverse can be defined as a shared virtual world where people can interact with each other and objects using avatars. On the other hand, social media platforms are online platforms that allow people to connect and share content [8].

The Metaverse and social media are, therefore, two technologies that can be used to create immersive and engaging experiences. In particular, the Metaverse can be used to create virtual worlds where people can interact with each other in a more natu-

ral and realistic manner. Social media, on the other hand, can be used to promote and share these experiences.

Until a few years ago in social media, follower count and the number of "friendships" took priority, but today there is a new emphasis on community and platforms that promote significant and authentic connections. Exactly with this push, the Metaverse is quickly becoming the next incarnation of social media. Instead of static posts or videos with minimal ways to engage, the Metaverse will enable users to connect on tangible, shared experiences; it will provide opportunities for people to interact and create deeper connections [9]. As evidence that this transition to the Metaverse is already underway, just think that last October Facebook, the company that leads the homonymous social network, Instagram, WhatsApp, and Oculus, officially changed its name to "Meta" to reflect the group's new focus more clearly. After a decade of being the largest social business player, the ex-Facebook is now completely turned toward the Metaverse focus, and every fiber of the company seems to be looking in that direction (Figure 4).

In the field of design and representation, these tools can be of great assistance. In fact, the Metaverse can be used to create 3D models of new buildings. These models can then be shared on social media to allow people to view them and provide feedback. The Metaverse and social media can be employed to create immersive and engaging experiences that help individuals better understand the world around them.

From an educational standpoint, the Metaverse can be utilized to create immersive learning experiences, enabling students to explore different environments and situations.

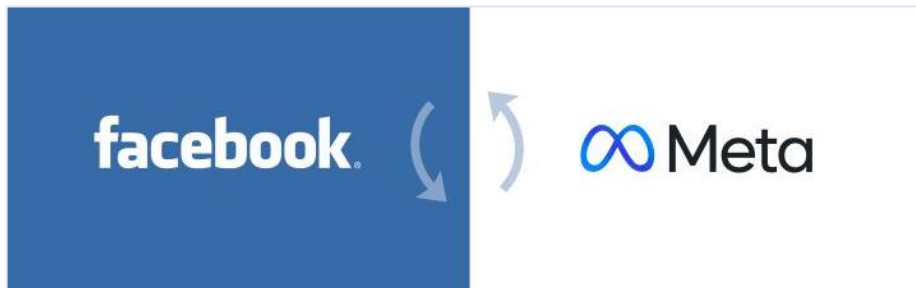


Fig. 4. Facebook and Meta.

4 Metaverse and education

It is clear that the transition to the Metaverse is an unstoppable and pervasive process in every sector. For these reasons, many scientists and researchers, from even distant fields, are facing this unsettling transition to a new way of living and understanding the digital [10].

One of the first studies to define what the Metaverse is and how it will fit into our lives over the years was carried out in 2007 by the Acceleration Studies Foundation (ASF) and its supporting foresight partners. ASF is an educational nonprofit engaged

in outreach, education, research, and selective advocacy with respect to issues and processes of accelerating change [11].

This study declared that the Metaverse would be primarily influenced by two factors: 1. the spectrum of technologies and applications ranging from augmentation to simulation; 2. the spectrum ranging from context, this means technologies that layer new control systems and information onto our perception of the physical environment. Combining these two factors, the study said that 4 would be the key components of the future Metaverse: Virtual Worlds; Mirror Worlds; Augmented Reality; Life-logging [12]. This conception is an early idea of the Metaverse. Over the years, more new definitions of the Metaverse have followed together with technological advancement [13] [14]. A recent definition of Metaverse can be read in the document dated March 9, 2022, titled ART, and published by the General Secretariat of the Council of European Union which declares: “Metaverse is an immersive and constant virtual 3D world where people interact through an avatar to enjoy entertainment, make purchases and carry out transactions with crypto-assets, or work without leaving their seat”.

Referring to this last definition, it is immediate to remind the radical change in education delivery methods that took place due to the COVID-19 pandemic, where most students attended lectures via remote video meetings from their homes. This change has worsened students' active participation in the classroom [15].

A study by Aristovnik et al. dated 2020 [16], shows that students reported difficulty concentrating during online classes compared to in-person classes and had worse learning outcomes and a study by Faura-Martínez, Lafuente-Lechuga, and Cifuentes-Faura, dated 2021, found that 72 percent of 3080 participants reported difficulty with the curriculum after switching to digital learning.

It emerges how video-remote education has limitations in replacing in-person classes [17].

This research focuses on how the Metaverse can compensate for the weaknesses of existing remote models. The Metaverse in education will be able to be considered as a learning environment powered by related technologies that merge with the elements of the virtual and real educational environment [18]. The ability to provide students with wearable devices to enter the educational environment without being limited by time and place and allows them to use digital identities to have real-time interactions with different object types [19].

From an educational perspective in the field of representation, it is important to focus on these three aspects:

- 3D Modeling: the Metaverse can be utilized to create realistic 3D models of buildings, landscapes, and other environments. These models enable students to explore these environments in a realistic and engaging manner.

- Virtual Reality and Augmented Reality: the Metaverse can be used to create virtual reality and augmented reality experiences, allowing students to immerse themselves in virtual environments and interact with them more realistically.

- Collaboration: the Metaverse can facilitate collaboration among students worldwide, aiding them in working together on projects and activities more efficiently, leading to more innovative solutions.

There are already specific examples of how universities are leveraging the Metaverse to create immersive learning experiences [20] [21]. Stanford University introduced a virtual reality program called "Virtual Design and Construction," used by architecture students to design and construct virtual buildings. Launched in 2022, the program has significantly impacted Stanford's architecture curriculum, with students reporting more efficient building design and a better understanding of architectural principles (Figure 5).

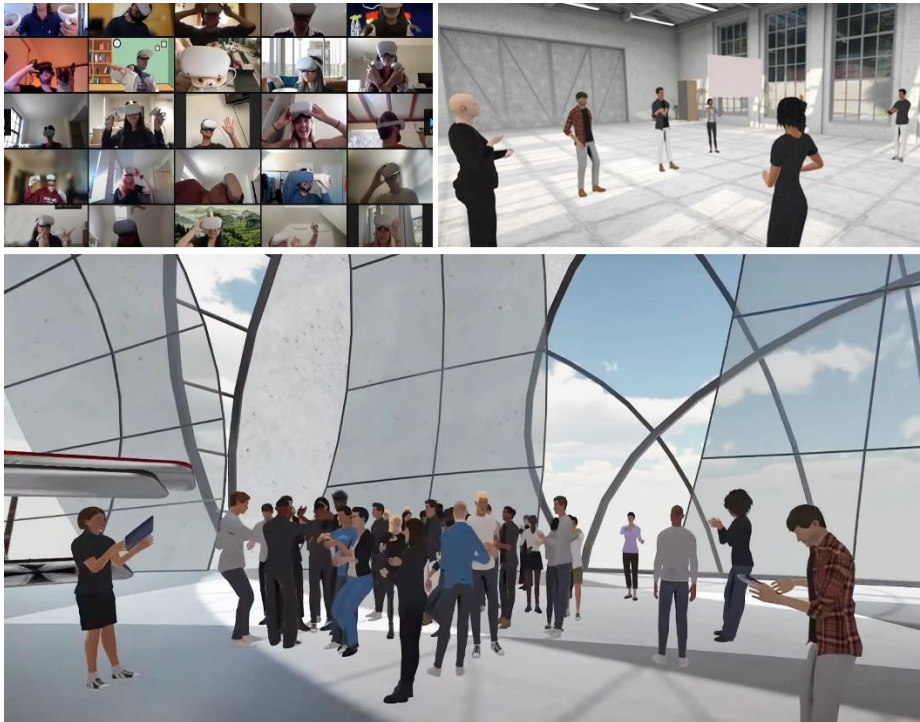


Fig. 5. Stanford "Virtual People" class in the Metaverse.

The University of Michigan established a Virtual Reality Lab, where students from various disciplines explore the virtual world and create immersive experiences. Equipped with cutting-edge tools like VR headsets, motion sensors, and development software, the lab serves purposes such as research, teaching, and artistic creation.

Engineering students use it for developing new design and simulation methods, medical students for learning diagnosis and treatment, and art students for creating digital art. Harvard University introduced a course on augmented reality titled "Augmented Reality in Education," teaching students how to use augmented reality to create engaging learning experiences.

The University of Missouri is using the Metaverse to create a virtual learning environment for architecture students. This environment, called "MU Metaverse," will allow students to explore architectural projects in a realistic and engaging manner.

The MU Metaverse is built on the Oculus virtual reality (VR) platform. Students will be able to use a VR headset to access the environment and interact with architectural projects. The MU Metaverse will include a range of features enabling students to explore projects in-depth. For instance, students will be able to walk within the projects, observe them from different perspectives, and interact with objects. While the MU Metaverse is still in development, the university aims to make it available to students by the end of 2023.

In the future, an increase in the use of the Metaverse in universities is likely. These technologies have the potential to make learning more engaging, effective, and accessible. Specific examples of how the Metaverse could be used in education include:

- Laboratory simulations: Students can use virtual reality to safely experience dangerous or expensive experiments;
- Historical site visits: students can virtually visit historical sites worldwide without leaving their city;
- Remote collaboration: students can collaboratively work on complex projects in real-time;
- Personalized learning: students can receive personalized learning based on their needs and interests.

The Metaverse has the potential to transform education and make learning more accessible, engaging, effective, and innovative.

5 Conclusions

In the field of drawing education, the Metaverse emerges as a catalytic force with the potential to redefine the entire learning paradigm. Its revolutionary capacity lies in the provision of avant-garde tools and immersive environments that transcend conventional pedagogical approaches, empowering students to delve into novel realms of visual communication [22]. Beyond the confines of traditional methodologies, the Metaverse stands as a transformative juggernaut capable of reshaping not only educational landscapes but various other sectors as well.

The ongoing evolution of the Metaverse necessitates a meticulous examination of its inherent strengths and weaknesses, strategically harnessing its vast potential to amplify the learning experience and seamlessly bridge the chasm between the virtual and tangible worlds. The Metaverse unfolds as an unprecedented reservoir of exciting prospects for educators and learners alike. Its dynamic trajectory promises to usher in a new era of digital education, characterized by unparalleled engagement, interactivity, and innovation. As we navigate this uncharted terrain, it becomes imperative for educators, researchers, and policymakers to collaboratively navigate the intricacies of the Metaverse. By doing so, we can unlock its full spectrum of capabilities, ultimately fostering a learning environment that transcends the boundaries of traditional education. The Metaverse, with its transformative prowess, invites us to embark on a journey of educational exploration, propelling us towards a future where the fusion of technology and pedagogy yields unparalleled opportunities for knowledge dissemination and acquisition.

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