

# Challenges of using the metaverse and AI in education and possible negative aspects: A brief synthesis of the specialized literature

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**Abstract:** *The goal of paper is to investigate the challenges, positive and negative appearances of implementing AI and Metaverse in the realm of education. The open-access databases, such as WoS, Scopus, and Google Scholar, have been utilized for publications reflecting the acquired experience in this field. The recent articles related to the topic have been carefully examined and the major conclusions summarised and presented. The analyses support the common belief that AI will accelerate research and improve students' understanding in various subjects. However, it also has the potential to weaken critical thinking and diminish the independence of individuals in forming their statements and conclusions. In order to successfully implement new technologies, it is essential to invest significantly in infrastructure and develop effective training programs for educators. It is essential to carefully observe, assess, and address the potential disadvantages of AI and Metaverse when integrating them into future curricula. The responsibility for effectively applying innovative approaches to learning and education for future generations lies with teachers, educators, governments, and stakeholders. Proper implementation requires a critical and comprehensive overview of gained experience.*

**Keywords:** Metaverse, Higher education, AI, Negative aspects.

## 1. Literature review

A thorough discussion on the integration of metaverse and artificial intelligence within educational frameworks is essential. It is important to consider advantages, potential challenges and adverse effects associated with this emerging scenery. These recent technologies transform education and reshaping education, improve learning outcomes, give practical benefits (Munde & Kaur, 2023; Nigmatullina, 2024; Almeman et al., 2025; Mohamed, 2025), enhance learning, and develop digital competencies (Svoboda & Knihová, 2025). Authors assert that integrating the metaverse into education, along with the use of AI applications; will enhance students' understanding across various academic disciplines (Inceoglu & Ciloglugil, 2022; Almeman et al., 2024; Nigmatullina, 2024; Vieriu & Petrea, 2025). AI and metaverse have promise to reformat learning and teaching settings, leading for a more engaging, efficient, retained, and accessible education in the future (Munde & Kaur, 2023; Fadhel et al., 2024).

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However, these approaches require a robust and costly infrastructure, which may pose significant challenges and hinder accessibility for institutions and students (Nigmatullina, 2024). As well, content creation is also essential to ensure effective learning. Plenty challenges including technological barriers, costs, and ethical concerns also exist (Akbar et al., 2024). Concerns regarding algorithmic bias, diminished interpersonal interaction, technological dependence, and weakened critical thinking skills are highlighted as significant issues (Lin et al., 2022). While other authors claimed that immersive technologies foster critical thinking and creativity among students, enhancing learning experiences (Akbar, 2024). Obviously, there exist two polarizing, controversial opinions among educators.

AI can negatively impact education by reducing the level of human interaction between students and teachers, which is essential for emotional support and social development (Vernersson, 2025). Concerns regarding digital fatigue, loneliness, technostress, and reduced face-to-face interactions appear (Klimova & Pikhart, 2025).

The metaverse also presents potential negative aspects. These include the risk of social isolation and disconnection from the physical world, possible mental health issues like addiction and anxiety, and physical health problems due to lack of physical activity (Tharwani, 2022; Dalmacito, 2024). There are also concerns about privacy, security, and the potential for exploitation of user's data (Kye et al., 2022). Moreover, the metaverse may exacerbate existing inequalities by requiring expensive equipment and potentially disadvantaging those with disabilities or limited internet access.

The discussion about how much, where, and how to implement the metaverse and AI is not only necessary, but it is obligatory process for the best and safety use of these technologies in education. The article aims to present several aspects of the realization of Metaverse and AI in education, gaining an understanding of the positive and negative effects will enable to maximize the potential benefits.

## **2. Research statement and methodology**

The research problem is to assess how useful the transformation of the education with AI and the metaverse is and whether there are potential negative aspects that can be taken under consideration to receive the best results. The objective of this article is to examine various facets of the integration of the Metaverse and artificial intelligence in education. By comprehensively understanding both the advantageous and disadvantageous implications, stakeholders will be better positioned to optimize the potential benefits associated with these technologies.

This research aims to analyse the impact of artificial intelligence and the metaverse on education based on the current data stream. The open-access databases, including Web of Science (WoS), Scopus, and Google Scholar, have been used to gather publications that reflect the accumulated experience in this

field. The keywords for searching were “metaverse”, “AI”, “negative aspects”, “challenges”, “higher education” and different combinations between them connecting to the revealed experiences. Recent articles related to this topic have been thoroughly reviewed, and the key findings have been summarized and presented.

The following sections outline the foundation of the research:

- Challenges associated with the implementation of AI and metaverse.
- Possible Negative Aspects of the Metaverse Environment.

### **3. Challenges of implementation the metaverse and AI in education**

The challenges section would logically encompass the technical and financial demands of building and sustaining a robust metaverse educational platform, infrastructure investments, which can be a financial problem for schools and educational institutions (Hao & Lailin, 2022; Alhalaybeh et al., 2023; Meena et al., 2023; Akbar et al., 2024; Pradeep et al., 2024). The technical aspects of the metaverse require ongoing maintenance and support, which can be a strain on school resources. Companies like Meta (formerly Facebook), Google, and Microsoft have invested heavily in the metaverse, aiming to build infrastructure and tools that will make it accessible to individuals and businesses worldwide (Pradeep et al., 2024).

Creating engaging and effective educational content for the metaverse can be technically challenging, requiring specialized skills, the expense of hardware and software, and resources, and concerns regarding privacy and security (Alhalaybeh et al., 2023), there is a limited availability of relevant scholarly material (Al-Maatoq et al., 2023). The metaverse relies on advanced technology and high-speed internet, accessibility issues, for students in rural areas lacking adequate devices and internet connections, high costs of VR headsets would be problem (Hartina et al., 2024). The use of VR headsets, specialized software, and other necessary equipment can be expensive, further limiting access and creating a barrier for some students and schools (Samala et al., 2025). Equally, concerns regarding data security and privacy must be addressed for effective implementation (Hartina et al., 2024).

The metaverse collects extensive data on user behavior, which can be a privacy concern (Rane et al., 2024). There are risks associated with data breaches and the potential for misuse of student data. The virtual nature of the metaverse can create opportunities for identity theft and cyberbullying, posing risks to student safety and well-being.

Foreseeable the Metaverse holds significant potential to enhance educational development, provided that educational curricula are thoughtfully crafted to leverage its advantages while addressing concerns such as data privacy, academic integrity, and the preservation of independent critical thinking. Educators must prioritize information security, the ethical use of AI, and the promotion of

independent thought to ensure the responsible integration of Metaverse technologies in education (Lin et al., 2022).

The connection between education, AI applications, and the metaverse is clear, but there is a significant need for more research into the challenges, teaching methods, and knowledge aspects involved, plus on the role of pedagogical design and teacher training for successful implementation (Pradana & Elisa, 2023; Munde & Kaur, 2023; Hartina et al., 2024). Table 1 summarize the common advantages and disadvantages of AI.

**Table 1.** Advantages and disadvantages of AI (by Duggal, 2025)

<b>Advantages of Artificial Intelligence</b>	<b>Disadvantages of AI</b>
Reduction in Human Error	Lack of human creativity and emotional intelligence
Enhances decision-making	Risk of job displacement
Works 24/7 without fatigue	Privacy and security concerns
Increases efficiency and automation	Ethical concerns and AI bias
Improves personalization in user experiences	Potential for misuse in deepfakes and misinformation

AI took irreversible place in the education, according to Svoboda & Knirová (2025), in 2024, AI - driven tools and approaches became more deeply integrated into education (see Table 2).

**Table 2.** AI - driven tools and approaches deeply integrated into education (Svoboda & Knirová 2025)

<b>AI - driven tools</b>	<b>Incorporated into education</b>
<b>Learning in conversation with Generative AI</b>	Students use AI systems, like ChatGPT, to create text that looks like it was written by a person. They give the system prompts, and it responds with human-like writing.
<b>Immersive language and culture are a learning approach</b>	Students engage deeply with a language and its culture, often using virtual or augmented reality environments.
<b>AI-enhanced multimodal writing</b>	Using artificial intelligence to enhance the creation of written content that includes text, images, audio, and video.
<b>Talking about AI ethics with young people</b>	Engaging discussions and educational initiatives that focus on the ethical considerations and implications associated with artificial intelligence.
<b>Intelligent textbooks</b>	These textbooks adapt to learning paces, provide real-time feedback, and include multimedia elements like videos and simulations.
<b>Climate action pedagogy</b>	An educational approach that teaches students about climate change and the importance of sustainability and action.
<b>Pedagogies of peace</b>	An educational approach that promotes peace, non-violence, and social justice through teaching and learning practices.

<b>Exploring scientific models from the inside</b>	An educational approach that enables students to develop a deep understanding of scientific concepts.
<b>Comparative document analysis conclusion</b>	Various teaching methods have been developed to incorporate new technologies and enhance inclusion. Multiple pedagogies have emerged to integrate innovative technologies and inclusive approaches.

By facilitating global connectivity, decentralized economies, and innovative platforms for collaboration and creativity, the metaverse emerges as a transformative force with far-reaching societal and economic implications, across various sectors, including education, healthcare, entertainment, commerce, and the future of work (Pradeep et al., 2024). Nonetheless, the need to develop valid instruments to evaluate the educational experience generated in the metaverse is noticeable (López-Belmonte et al, 2023).

#### **4. Possible negative aspects of the metaverse environment**

The concept of the metaverse in education progressed from virtual laboratories to immersive learning environments (Svoboda & Knihová, 2025). The immersive nature of the metaverse can lead to a loss of focus and potential mental health issues if used excessively (Cordero, 2024). The expansion of Metaverse presents both opportunities and challenges for individuals. Although this technology cannot replace the role of the educator, it is imperative for educators to develop solutions that facilitate authentic learning experiences for students.

Nowadays, it is imperative to remain vigilant regarding the potential negative influences of Metaverse technology on education (Tira et al., 2022). Identifying these confronts is essential for developing effective curricula that enhance the advantages of digital education while reducing negative impacts linked to the metaverse and AI (Kye et al., 2022). A prerequisite for discussing the implementation of educational policies in the Metaverse is to address potential negative implications for students (Khandakar et al., 2023).

Numerous negative consequences are mentioned from applying metaverse and AI in education. One of the adverse outcomes is reducing the independent thinking (Tira et al., 2022; Kochhann et al., 2023; Nigmatullina, 2024; Oulahyane et al., 2024). Another negative effect can be privacy abuses, propagation of misinformation, invasive advertising, phishing, financial crimes, terrorist activities, pornography, social inclusion, cyberbullying and sexual harassment (Dwivedi et al., 2023). Further concern is a possible digital addiction, unhealthy online behaviour, probable virtual harm, destructive psychological stuffs, and identity confusion from heavy metaverse use (Alomari et al., 2024; Chawki et al., 2024; Almeman et al., 2025).

The possible health problem arising from immersive learning environment of Metaverse has been mentioned by many authors in their works (Bale et al., 2022; Tharwani, 2022; Ifdil et al., 2023). Lack of physical activity in the metaverse can contribute to health problems like obesity, high blood pressure, and type 2 diabetes

(Dalmacito & Cordero, 2024). The metaverse does not only affect physical health but it badly impacts mental health (Tharwani, 2022). The lack of regulation and user control in some metaverse platforms can lead to concerns about content moderation and the safety of students. The metaverse may limit the sensory input that students receive, which can be crucial for some learning styles.

The virtual nature of the metaverse can lead to a lack of face-to-face social interaction and real physical activity, even losing touch with physical human interactions (Dalmacito & Cordero, 2024), which may hinder the development of important social skills. Prolonged metaverse use can lead to a decline in real-world social interactions and a potential loss of touch with physical connections (Cordero, 2024). A virtual world can string imagination to real life (Bale et al., 2022), necessity of balancing virtual and physical realities (Pradeep et al., 2024).

The immersive nature of the metaverse can lead to addiction, anxiety, and other mental health concerns, especially in children and teenagers, and can create addictive behaviors, leading individuals to spend excessive time in virtual worlds and neglect real-life responsibilities. The immersive nature of the metaverse can lead to addictive behaviors and a tendency to escape real-life responsibilities, potentially impacting mental health. The habit of entering the virtual world creates a strong sense of dependency which later may cause addiction (Cordero, 2024).

A few signs of digital addiction (Tharwani, 2022) are:

- Using digital devices for hours.
- Thinking about digital use when not digitally active.
- Experiencing cravings and urges to use your digital device.
- Loss of interest in social activities that were once found pleasurable.
- Using digital devices in dangerous situations like crossing the road, riding, cooking, etc.

Learning in metaverse immersive environment can induce simulator sickness or motion sickness. Simulator sickness negatively impacts student engagement and learning outcomes even can lead to withdraw from training (Pedram et al., 2021; Atsikpasi & Fokides, 2022). The symptoms of simulator sickness include pallor, nausea, disorientation, and sometimes vomiting or eyestrain, which occur due to the disconnection between virtual and real experiences (Kenngott et al., 2021; Fokides & Antonopoulos, 2023), visually induced illusory self-motion is known asvection, thatvection in a fixed-base simulator would be a necessary precondition for simulator sickness (Hettinger et al., 1990). Conversely, others have reported that even mild simulator sickness negatively impacted mental workload and learning outcomes (Hsin et al., 2022). Therefore, addressing this issue is essential for maximizing the benefits of metaverse education.

Chang et al. (2020) identify sensory mismatches as the root cause of VR sickness:

- *Sensory Conflict*: the primary cause is the conflict between visual motion perceived in the virtual environment and the body's sense of stillness, leading to symptoms similar to motion sickness.
- *Optic Flow and Vection*: the visual stimuli within a VR experience,

particularly the way the environment appears to move around the user (optic flow), can induce a sensation of self-motion (vection), which contributes to sickness.

- *Technical Factors*: issues such as low frame rates, high latency, and poor display quality can exacerbate these sensory conflicts and increase sickness.

The hardware, content, and human are the three major aspects causes of VR sickness (Chang et al., 2020; Saredakis et al., 2020). VR sickness has not been resolved yet by the improved performance of the hardware (Chang et al., 2020). VR sickness can be provoked from stereoscopic content that can lead to more severe VR sickness (Kim et al., 2014; Dennison et al., 2016), from a time difference between what the user expected to see and what was viewed, known as latency, which is closely related to VR sickness (Rebenitsch & Owen, 2016). Additionally, VR sickness can be caused by display flickering (Kolasinski, 1995; LaViola, 2000; Renkewitz & Alexander, 2007), which visually disturbs and affects the user's eye health.

## 5. Conclusion

The metaverse collects a significant amount of user data, which raises concerns about privacy violations and the potential misuse of information. Participating in the metaverse requires expensive technology and high-speed internet, creating barriers for marginalized communities and exacerbating the digital divide. Additionally, issues such as discrimination, harassment, and exploitation may arise within the metaverse, making it essential to carefully consider its ethical implications. Some studies suggest that the sensation of embodiment experienced in the metaverse could lead to a disconnect from reality, resulting in a loss of connection to physical experiences. Students may become overly focused on the virtual environment, causing them to lose sight of their learning objectives, which could negatively impact their academic performance. Those who spend considerable time in the metaverse might struggle to adapt to the complexities of the real world.

Although it is well-established that the metaverse and AI can enhance understanding and stimulate knowledge acquisition among learners, questions regarding their accessibility, safety, cost, and health impacts remain pressing and urgent. The upcoming training will aim to improve their implementation in education.

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