Dr. Tulima Dey
Librarian, Rishi Bankim Chandra College for Women
tulima44@gmail.com

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Metaverse: as a Landscape for Blended Teaching and Learning

Tulima Dey

Abstract:

The rapid evolution of Information and Communication Technology (ICT) has precipitated a paradigm shift in education, moving from traditional physical classrooms to dynamic, virtual, and hybrid environments. This article explores the conceptual foundations and pedagogical potential of the Metaverse—a collective virtual shared platform converging Virtual Reality (VR), Augmented Reality (AR), and physically persistent virtual spaces. While online education via MOOCs and synchronous platforms (e.g., Zoom, Teams) has expanded access, it often suffers from limited self-perception, passive participation, and restricted 2D engagement. This study identifies how the Metaverse can transcend these limitations by fostering immersive, personalized, and collaborative learning through four primary modalities: augmented reality, lifelogging, mirror worlds, and virtual reality. By integrating Artificial Intelligence (AI) and Machine Learning (ML), the Metaverse enables sophisticated student assessment through sentiment and gesture analysis, while Non-Player-Characters (NPCs) provide real-time, intelligent tutoring. The article proposes a mixed Metaverse system that bridges multiple physical campuses with remote online participants, allowing for real-time interaction via digital twins (avatars). This framework supports diverse methodologies, including project-based, problem-based, and mobile cloud learning. Despite the promise of high-fidelity simulations and professional training cost-reduction, the study concludes that widespread adoption necessitates overcoming significant infrastructural hurdles, including network bandwidth, hardware costs, and the development of inclusive architectures for socioeconomically disadvantaged and physically challenged learners.

Keywords: Metaverse, Virtual Reality (VR), Online Education, Hybrid Learning, Artificial Intelligence in Education, Immersive Technology, Pedagogical Innovation.

1. Introduction:

The concept of the 'Metaverse' is a collective virtually shared platform, combine Virtual reality (VR) and Augmented Reality (PR) and create a real time experience that a mimic form of real-life interaction. On this platform participants have an opportunity to interact with computer- generated world. This real time interaction platform has gained significant attention in recent years. Whereas the concepts "Metaverse" is not entirely new. The concept first introduced by Neal Stephenson in his 1992 novel (Stephenson,1992)[1]. The term has also evolved into a concrete architectural concept in higher education following massive corporate reinvestments and infrastructural breakthroughs, and within modern pedagogy, the Edu-Metaverse is conceptualized as a continuous, shared virtual-physical ecosystem powered by immersive, adaptive technologies (Illi & Elhassouny, 2025; Mitra, 2023)[2]. Since then, various metaverse platforms have emerged, with *Second Life*, developed by Linden Lab in 2003, gaining significant popularity.

The tools and technologies of metaverse have become increasingly significant for advance teaching learning system due its potential application. As the Metaverse continues to evolve, it presents new opportunities and challenges for teaching learning process that require a new set of skills and competencies from teachers and students alike.

1.1 Metaverse: It is stated that the Metaverse is the convergence of

(i) virtually enhanced physical reality and
(ii) physically persistent virtual space.

It is a fusion of both, while allowing users to experience it as either. Although the "Web" technically refers to a particular set of protocols and online applications, the term has become shorthand for online life only. Whereas it's possible that "Metaverse" will come to have this same duality: referring to both a particular set of virtualizing and 3D web technologies, and the standard way in which we think of life online. Like the Web, the Metaverse would not be the entirety of the Internet—but like the Web, it would be seen by many as the most important part.

1.2 Online Education:

Application and advancement of ICT (Information and Communication Technology) on the online education have gained a lot of new prospects and popularity in recent years. Massive Open Online Courses (MOOCs) are publicly available and commonly attended by many participants from around the world specifically remote parts of the world. Both synchronous and asynchronous teaching-learning systems are the primary focus of online education. Interaction between professionals, students, and educators is made possible via synchronous systems which are in real time or concurrently in a digital virtual environment e. g. Webex, Skype, Zoom, and Microsoft Teams are a few additional popular synchronous platforms. Participants in asynchronous systems, however, are free to engage at their own pace and convenience. Teachers and students save time

[1]Neal Stephenson, *Snow Crash* (New York: Bantam Books, 1992). The concept was first introduced by Stephenson in this novel.

[2]Illi, C., & Elhassouny, A. (2025). Edu-Metaverse: A comprehensive review of virtual learning environments. *IEEE Access*, *13*, 30186–30211. https://doi.org/10.1109/ACCESS.2025.3540944

by reducing repetitious work with automated tasks. Asynchronous tools include learning management systems (LMS) such as Moodle, Blackboard, and social networks.

2. Review of Literature:

Previous research on Metaverse technology and its application on teaching learning system can be categorized on following sub heading.

2.1 Technological Drivers of the Blended Educational Landscape.

Illi and Elhassouny (2025) stated that the structural viability of a metaverse-based blended learning (MBBL) framework rests upon three core technological pillars that's are (Illi & Elhassouny, 2025)[3]:

(i) Extended Reality (XR) & Immersive Interfaces:

The integration of head-mounted displays (HMDs), haptic sensors, and spatial audio creates a high degree of student presence—the psychological sense of "being there" within a virtual environment. This combination enables learners to interact with scientific phenomena that are otherwise invisible, too small for the naked eye, or too abstract for traditional textbooks. Head-mounted displays (HMDs), haptic sensors, and spatial audio mechanics drive student presence, allowing abstract or micro-level scientific concepts to be physically visualized and manipulated (De Felice et al., 2023; Kurniawan, 2026)[4].

(ii) Digital Twins (DT):

Another effective tools in Metaverse are Digital Twins, that is the creation of high-fidelity, functional digital replicas of actual laboratories or corporate training spaces allows students to interact with real-world parameters without material waste or physical hazards (Li, 2026; Mitra, 2023)[5].

(iii) Artificial Intelligence (AI) and Multimodal Analytics:

Metaverse tools has huge platform where AI algorithms act as core engines within the blended framework, running real-time behavior tracking, automating personalized feedback loops, and

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[3] Ibid; See Footnote-2

[4] De Felice, F., Petrillo, A., Iovine, G., Salzano, C., & Baffo, I. (2023). How does the Metaverse shape education? A systematic literature review. *Applied Sciences*, *13*(9), Article 5682. https://doi.org/10.3390/app13095682

[5] Li, M. (2026). Design and application of an integrated metaverse-based immersive learning environment in higher education. *Cogent Education*, *13*(1), Article 2635785. https://doi.org/10.1080/2331186X.2026.2635785

modulating task complexity based on student performance (Dang, D. 2026)[6]; (Li, M. 2026)[7]. AI-powered algorithms continuously analyze learners' interactions across multiple modalities, such as speech, gestures, eye movements, facial expressions, and performance data, through multimodal analytics. This enables real-time monitoring of learner behavior, automated feedback generation, and dynamic adjustment of task difficulty according to individual learning needs and progress. Consequently, AI and multimodal analytics support personalized learning pathways, enhance learner engagement, and facilitate timely instructional interventions, thereby improving the effectiveness of teaching and learning within immersive metaverse environments.

2.2 Pedagogical Models and Learning Activity Architecture and Metaverse.

The statement that "traditional learning delivery models frequently rely on text-heavy materials or flat visual media, which struggle to provide active hands-on training" highlights a common limitation of conventional educational approaches (International Nautical Institute, 2025)[8]. Traditional instructional methods, such as textbooks, printed manuals, slide presentations, and two-dimensional videos, are effective for transmitting theoretical knowledge and foundational concepts. However, they often provide limited opportunities for learners to engage directly with practical tasks, equipment, or real-world scenarios (Du, L. 2026)[9]; (Mitra, S. 2023)[10]. Rather than merely replicating traditional classroom practices, the metaverse supports learner-centered approaches such as constructivism, experiential learning, collaborative learning, inquiry-based learning, and problem-based learning. Learning activity architecture provides a structured framework for sequencing activities, defining learner roles, facilitating social interactions, and integrating physical and virtual learning spaces. Through avatars, simulations, and shared virtual environments, learners actively construct knowledge, collaborate with peers, and engage in authentic and contextualized experiences. Consequently, the metaverse enables flexible,

[6] Dang, D. (2026). Blended learning design in higher education: A systematic review through TPACK and AI role perspective (2020–2025). *Education Sciences*, *16*(6), Article 848. https://doi.org/10.3390/educsci16060848[^1] [6]

[7] Li, M. (2026). Design and application of an integrated metaverse-based immersive learning environment in higher education. *Cogent Education*, *13*(1), Article 2635785. [5] https://doi.org/10.1080/2331186X.2026.2635785

[8] International Nautical Institute. (2025). *Text, video, simulations and more: What is the most effective media for maritime training?* The Nautical Institute. https://www.nautinst.org/static/258bddde-53b7-4934-9c65fca26687343b/HE01200-Text-Video-Simulations-and-More-What-is-the-Most-Effective-Media-for-Maritime-Training.pdf

[9] Du, L. (2026). Comparative analysis of traditional and metaverse-based education: impacts on students' all-round development. *Palgrave Communications / Humanities and Social Sciences Communications*, *13*, Article 12924519. https://doi.org/10.1057/s41599-026-12924519[^2]

[10] Mitra, S. (2023). Metaverse: A potential virtual-physical ecosystem for innovative blended education and training. *Journal of Metaverse*, *3*(1), 66–72. https://doi.org/10.57019/jmv.1168056

interactive, and personalized learning ecosystems that enhance engagement, creativity, and deeper understanding.

2.3 Student Readiness, Motivation, and Learning Outcomes:

Scholarly assessments of Generation Z and undergraduate cohorts indicate a high level of technological readiness for immersive deployment (Jiao, Y. n.d.)[11] & (Xie, J. et.al., n.d.)[12]. Empirical evaluations using the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) identify distinct behavioral impacts resulting from this readiness (Xie, n.d.):

(i) Intrinsic Motivation & Social Belonging:
Immersive avatars, spatial audio, and localized chat systems reduce the profound psychological isolation often caused by traditional learning management systems (Dang, 2026)[13]. This simulated physical presence triggers stronger intrinsic motivation and group cohesion during remote blended learning cycles (Du, L. et.al, 2026)[14]

(ii) Skill Acquisition:
Comparative studies between conventional presentation-based instruction and MBBL setups demonstrate substantial improvements in student outcomes. The immersive environment accelerates intellectual and cognitive development by placing student interaction inside simulated contextual settings rather than abstract text guidelines (Du, L., Kuo, W. T., Tang, Y. M., & Ho, G. T. S. 2026)[15].

3. Objectives of this Study:

(i) To identify the problem of the s t u d e n t s who are confined to passive participation with limited opportunities to participate or act in 2D perception virtual platform.
(ii) Identify the specific limitations that teachers face when explaining or delivering content in a digital format.
(iii) Proposed platform to overcome the difficult to assess properly the student's feelings and attention in the classes on online.

[11] Jiao, Y. (n.d.). Examining the need for a metaverse-based blended learning module in college English. *Journal of English Language Teaching*, Article EJ1495325.[^3]

[12] Xie, J., Al-Shaibani, G. K. S., Zhao, J., & Talib, O. (2025). *The current status and contributing factors of the metaverse adoption in education: A systematic review*. **Contemporary Educational Technology, 17**(4), Article ep593. https://doi.org/10.30935/cedtech/17301

[13] Ibid; See Footnote-6

[14] **Du, L., Kuo, W. T., Tang, Y. M., & Ho, G. T. S. (2026).** Comparative analysis of traditional and metaverse-based education: Impacts on students' all-round development. *BMC Psychology, 14*(1), Article 259. https://doi.org/10.1186/s40359-025-03914-3

[15] Ibid; See Footnote 14.

3.1 Research Questions:

The following questions have been attempted to be answered in this article by means of thorough research and the suggestion of some original concepts.

(i) What creative teaching and learning opportunities might the metaverse provide for students and teachers in terms of mobile, collaborative, personalized, project-based, blended/hybrid, and problem-based methodologies and techniques?

(ii) How can the hybrid virtual-physical approach effectively leverage the metaverse's promise in education?

(iii) How can the Metaverse in education serve students, scholars, and professionals in the virtual reality?

4. Methodology of this Study:

This study adopted a systematic literature review approach to examine the effectiveness of immersive technologies (metaverse) in supporting hands-on practice of blended mode of learning and teaching.

4.1 Search Strategy:

- Databases used (e.g., Scopus, Web of Science, Google Scholar, IEEE Xplore)
- Search keywords (Virtual reality, augmented reality, immersive learning, Metaverse Technology, Teaching and Learning Technology)
- Search period (2018-2025)

Relevant articles were retrieved from Scopus, Web of Science, IEEE Xplore, and Google Scholar using combinations of keywords such as "virtual reality," "augmented reality," "immersive learning," and "hands-on training" etc. The search was limited to peer-reviewed articles published between 2018 and 2025 in English. After removing duplicates and screening titles, abstracts, and full texts, eligible studies were selected for review. Data were extracted regarding study characteristics, technologies employed, participant groups, and key findings. The selected studies were analyzed using thematic synthesis to identify common trends, benefits, challenges, and research gaps in immersive learning applications.

4.2 Study Selection Process:

The initial search identified 425 records. After removing duplicates, 380 articles remained. Titles and abstracts were screened, resulting in 85 articles for full-text review. Finally, 42 studies met all eligibility criteria and were included in the analysis. For systematic reviews, this is often shown with a PRISMA flow diagram.

5. Data Analysis and Synthesis:

A thematic analysis approach was used to identify recurring themes related to learner engagement, skill acquisition, and training effectiveness. Findings were grouped into Types of Metaverse, Metaverse in Teaching Learning System, Potentiality of Metaverse in Education, Metaverse platform and simulation possibilities in Education, Innovative mentoring platform for the teachers, Personalized learning and assessments and Effective professional training and development.

5.1 Metaverse Types:

Technology in the external world primarily addresses the users' external surroundings, whereas the intimate world concentrates on the identities and actions of people or other entities. The creation of digital profiles or avatars allows users to have agency in the digital world and creates an inner world (Bailenson, J. N., 2018)[16]. The Acceleration Studies Foundation (ASF) declared the metaverse road-map in 2006 and presented the 4 types of metaverse: *augmented reality, lifelogging, mirror world, and virtual reality.* It also includes two axes namely 'Augmentation vs Simulation' and 'External vs Intimate' (Lee. L-H; et al., 2021)[17]. A synopsis of the four categories of the metaverse is given below.

i) Augmented Reality:

One kind of enhancement of the outside world is augmented reality. It alludes to the technology that uses networks and location-based technologies to create intelligent environments. It makes advantage of mobile devices' Wi-Fi and Global Positioning System (GPS) to give linkage data appropriate for users' location data. It creates actual 3D objects and superimposes them on top of real-world things. Zepeto is a facial recognition and avatar-making social media software. Applications for augmented reality can be found in the fields of education and health sciences, including cellphones, automobile HUDs, and surgery.

ii) Lifelogging:

The technology used in lifelogging, an enhancement of internal world features, records, stores, and disseminates daily experiences and data about individuals and other entities. Examples of social media and SNS (Social Networking Site) include YouTube, Facebook, Twitter, and blogs.

iii) Mirror Worlds:

The appearance, data, and organization of the real world are projected into a virtual reality as though it were in a mirror in a mirror world, which is a type of metaverse. It serves as a model for the

[16] Bailenson, J. N. (2018). *Experience on demand: What virtual reality is, how it works, and what it can do*. W. W. Norton & Company.

[17] Lee, L.-H., Braud, T., Zhou, P., Wang, L., Xu, D., Lin, Z., Kumar, A., Bermejo, C., & Hui, P. (2021). *All one needs to know about metaverse: A complete survey on technological singularity, virtual ecosystem, and research agenda*. *Journal of Latex Class Files, 14*(8), 1–66. https://arxiv.org/abs/2110.05352

real world. Map-based services like Google Earth and Google Maps Naver maps are one of the applications. Two helpful tools in education are digital labs and virtual learning environments like Zoom, Microsoft Teams, and Webex.

iv) Virtual World:

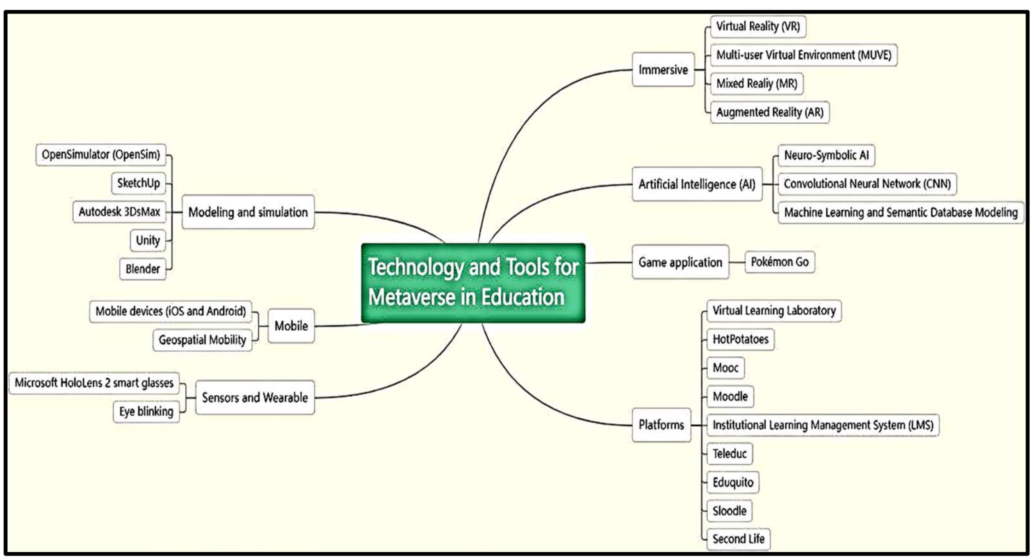
A metaverse that gives the user the impression that they are in a virtual reality is called a virtual world. Digital data is used to create the virtual environment. Technologies used in virtual reality include 3D images, avatars, and more. Multiple people can participate at once in this Internet-based 3D environment by generating avatars that are representations of themselves. Examples of virtual reality include Roblox, Second Life, and Zapeto.

5.2 Metaverse in Teaching Learning System:

The scope and expectation of the Metaverse in cutting-edge education and development were covered in this section. A synopsis of several recent studies on the application of the Metaverse for the same, along with issues in general. In this section, the scope and potential of Metaverse in innovative education and development discussed. A brief review of a few recent works on the use of Metaverse for the same, and challenges in general.

5.2.1 Potentiality of Metaverse in Education:

It is stated that the metaverse may be used extensively in several domains, including teaching learning and education. Here, the metaverse's potential can be effectively used to combine virtual reality with real classrooms and labs spaces to produce immersive learning opportunities.



https://doi.org/10.1186/s40561-022-00205-x

From the previous literature it is stated that Metaverse platform used for new learning possibilities in teaching and learning system e.g. virtual, blended, collaborative, personalized, and problem-based learning. (Damaševičius & Sidekerskienė, 2024)[18]; (Jovanović & Milosavljević, 2022)[19]; and (Marrone et al., 2023)[20]. Some study also highlights its use for mobile and hybrid learning (Li M. & Z, Yu, 2023)[21]; (Wang et al., 2022)[22]. Learners can benefit greatly from the pedagogical support and immersive learning experiences offered by the metaverse's tools and technologies. "Technology and Tools for Metaverse in Education" corresponds to the "Taxonomy of technology and tools used in Metaverse in education" presented in the article by Tlili et al. (2022)[23].

5.2.2 Metaverse platform and simulation possibilities in Education:

Metaverse tools and technology have an enormous simulation effect to the learner that they use metaverse tools in an innovative development. However, in the Metaverse, learners' senses of sight, hearing, and touch may be used to create a realistic environment that can accommodate their individual learning preferences. Boardrooms and offices in the real world can be replicated in the metaverse. It can establish virtual boardrooms that can provide employees with the impression of in-person discussions. Virtual meetings can be less distracting and more engaging than in-person distant video sessions. The implementation can make use of haptic technology, 3D virtual and augmented reality technologies, and simulation tools (Park & Kim, 2022)[15].

5.2.3 Innovative mentoring platform for the teachers:

Advanced technology of Metaverse platform blended the computer science and educational technology in one mode that teachers get expertise by mentoring both theoretical and practical on the latest applications of metaverse tools and technologies in education. The teachers should therefore be well-prepared to create cutting-edge educational metaverses and continue mentoring their peers and pupils. The six Cs—collaboration, communication, content, critical

[18] Damaševičius, R., & Sidekerskienė, T. (2024). *Virtual worlds for learning in metaverse: A narrative review*. **Sustainability, 16**(5), Article 2032. https://doi.org/10.3390/su16052032

[19] Jovanović, A., & Milosavljević, A. (2022). *VoRtex metaverse platform for gamified collaborative learning*. **Electronics, 11**(3), Article 317. https://doi.org/10.3390/electronics11030317

[20] M. Marrone, S. Stieglitz, and S. Elayan, (2023). *Co-creating' Experiential Learning in the Metaverse: Extending Kolb's Learning Cycle and Identifying Potential Challenges*. **The International Journal of Management Education 21,** no. 3 (2023): 100875. https://doi.org/10.1016/j.ijme.2023.100875

[21] Li, M., & Yu, Z. (2023). *A systematic review on the metaverse-based blended English learning*. **Frontiers in Psychology, 13**, Article 1087508. https://doi.org/10.3389/fpsyg.2022.1087508

[22] Wang, J., Wang, T., Shi, Y., Xu, D., Chen, Y., & Wu, J. (2022). *Metaverse, SED model, and new theory of value*. **Complexity, 2022**, Article 4771516. https://doi.org/10.1155/2022/4771516

[23] Tlili, A., Huang, R., Shehata, B., Liu, D., Zhao, J., Metwally, A. H. S., Wang, H., Denden, M., Bozkurt, A., Lee, L. H., Lampropoulos, G., Shadiev, R., Burgos, D., & Zhu, X. (2022). *Is metaverse in education a blessing or a curse: A combined content and bibliometric analysis*. Smart Learning Environments, 9(1), Article 24. https://doi.org/10.1186/s40561-022-00205-x

thinking, creative innovation, and confidence—discussed in can be taken into consideration in this situation (Golinkoff & Hirsh-Pasek, 2016)[24].

As a result, map for the real world can be modified from 2D to 3D which is more realistically including eye/body movement and voice recognition technologies which helps learner to make deeper understanding with virtual world and gets a more opportunistic for better understanding of concepts and subjects and Complex concepts, processes, and procedures can be better visualized and understood. Once more, the architecture of the Metaverse should consider of social relationships, exchanges, or communications involving participants' body language, touch, smell, and facial emotions. If virtual settings are used as a catalyst for interactions between actual individuals in a real or virtual context, rather than as a replacement for interaction, social relationships can be preserved. The authors argue that these six competencies—collaboration, communication, content, critical thinking, creative innovation, and confidence—are the pillars of modern educational success (Park & Kim, 2022)[25].

5.2.4 Personalized learning and assessments:

The metaverse tools and technologies give a continuous support from mentors/tutor's peer or another learner. AI (Artificial Intelligence) and ML (Machine Learning) play a vital role in this regard. NPCs (non-Player Characters) (13) of AI create virtual learning environment and where act like humans in the metaverse (Tlili et al., 2022)[26]. The learners' attention, comprehension perceptions, and brain retentions can be better understood with the help of various AI tools, such as facial recognition, sentiment analysis, gesture analysis, and body language analysis, including eye movement/blinking, head movement, and hand movement. Once more, ML can be used to gather information from prior training or teaching sessions of students or staff to improve course performance over time. This NPC or an intelligent tutor guides learners by answering frequently asked questions, evaluating their performance and give real time feedback.

5.2.5 Effective professional training and development:

An educational metaverse can comprise academic establishments such as schools, colleges, universities, and professional training centers on the one hand, and corporate entities or

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[24] Golinkoff, R. M., & Hirsh-Pasek, K. (2016). *Becoming brilliant: What science tells us about raising successful children*. American Psychological Association. https://doi.org/10.1037/14983-000

[25] Park, S. M., & Kim, Y. G. (2022). *A metaverse: Taxonomy, components, applications, and open challenges*. IEEE Access, 10, 4209– 4251.https://doi.org/10.1109/ACCESS.2021.3140175

[26] Tlili, A., Huang, R., Shehata, B., Liu, D., Zhao, J., Metwally, A. H. S., Wang, H., Denden, M., Bozkurt, ——A., Lee, L. H., Lampropoulos, G., Shadiev, R., Burgos, D., & Zhu, X. (2022). *Is metaverse in education a blessing or a curse: A combined content and bibliometric analysis*. Smart Learning Environments, 9(1), Article 24. https://doi.org/10.1186/s40561-022-00205-x

professional spaces on the other to give students the chance to gain professional experiences and real-world knowledge that they might not otherwise have access to in the real world because of risks, high costs, or a lack of resources. Regardless of time or location restrictions, the students can take part in a variety of training and development activities, such as practical labs and project internships. It might be a very affordable professional training platform (Tlili et al., 2022)[27].

6. Proposed Implementation Platform:

Based on an evaluative study of metaverse tools and recent developments in the current teaching–learning system, the following findings were recognized.

i) The Limitations of Traditional and Online Education:

Recent worldwide emergencies and pandemics highlighted the vulnerabilities of traditional physical classrooms and laboratories. Concurrently, the shift to online classes and video conferencing revealed a stark absence of genuine social relationships, interactive communication, and active engagement, often resulting in passive learning experiences.

ii) The Gap in Current AR/VR Solutions:

While Augmented Reality (AR) enriches the real world by superimposing digital information and Virtual Reality (VR) immerses users in fully virtual environments, current AR/VR educational tools still fall short. They offer immersive 3D visualization but fundamentally lack seamless communication features and robust remote access.

iii) The Promise of a Mixed Metaverse System:

By blending cutting-edge 3D visualization with both online and offline techniques, a mixed Metaverse system can bridge these educational gaps. This dynamic environment enhances student motivation, engagement, and learning efficiency by providing continuous support to students at any time and from any location, extending far beyond standard class hours.

iv) Integration of Modern Pedagogical Models:

According to researcher Stylianos Mystakidis, the Metaverse acts as a high-engagement interface that transforms passive content into highly interactive experiences. It achieves this by integrating virtual tools with diverse educational resources, including social networks, blended learning, mobile learning, and flipped or inverted classroom models.

v) Unified Blended Learning Environments:

Metaverse technology creates a cohesive, blended platform that integrates online spaces with multiple physical university campuses. In this unified space, participants from various physical

[27] Ibid; See Footnote-26.

locations and remote online environments coexist. Everyone is represented as an avatar (or digital twin), allowing all users to see one another and seamlessly participate in identical classroom instructions and hands-on laboratory work.

vi) Support for Active and Collaborative Learning:
This interconnected platform shifts the focus toward student-centric education. It naturally fosters activity-based, collaborative, problem-based, and project-based learning, providing students with ample opportunities to receive direct mentorship.

vii) Infrastructural Requirements for Success:
To successfully deploy and maintain a metaverse platform, robust infrastructure is essential. This includes managing high bandwidth to support real-time user interactivity, optimizing browser-based cloud streaming, and ensuring the platform can be easily deployed across smartphones, mobile devices, and standard web browsers.

Conclusion:

Our everyday lives, including work, education, training, and learning, have been affected by the recent pandemic circumstances. Given the constraints of social distance, infrastructure, time, and expense, we can anticipate that the Metaverse will serve as a platform that can generate numerous learning and training possibilities, even in fields that are currently impractical in the actual world. To meet the increasing technological challenges and demands of the academic and professional worlds some fruitful research and development on applications of the Metaverse in education and training will rise dramatically in the current decade due to the growing interest of the corporate world, including a few well-known multinational corporations.

However, in order for the metaverse platform to be practical and widely accepted, a number of present issues must be resolved. To enable users to experience an immersive and customized system, some of these issues include the design and development of creative content, strong hardware, fast networks, and inexpensive, lightweight devices with high resolutions. Research will be done in the future to create appropriate architectures to deal with these problems and investigate how the platform might help learners who are financially disadvantaged and physically challenged and who lack access to expensive devices or adequate infrastructure.

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