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# Guest editorial: Reinventing pedagogies and practices of 3d multi-user virtual environments (MUVEs) with the rise of blended learning

**Dilek Doğan[1], Ömer Demir[2*], Murat Çınar[3], Hakan Tüzün[4] and Michael K. Thomas[5]**
[1]Ankara University, Ankara, Türkiye // [2]Hakkari University, Hakkari, Türkiye // [3]Türkiye Ministry of National Education, Adana, Türkiye // [4]Hacettepe University, Ankara, Türkiye // [5]University of Illinois Chicago, Chicago, IL, USA // dilek.dogan@ankara.edu.tr // omerdemir@hakkari.edu.tr // murat_cinar@rocketmail.com // htuzun@hacettepe.edu.tr // micthom@uic.edu
[*]Corresponding author

**ABSTRACT:** 3D Multi-User Virtual Environments (MUVEs) have increasingly become more practical with faster Internet connections, the high processing capacity of ICT devices, and the readiness of learners. However, the educational potential of these immersive worlds in academic settings is closely linked to the combination of appropriate pedagogical and technical design elements. 3D MUVEs that only offer a more immersive experience for their users run the risk of becoming purely performative platforms if they fail to offer appropriately enhanced pedagogical approaches. We, therefore, invite the academic community to focus more on the pedagogical approaches of 3D MUVEs. In this context, this collection of papers aims to outline pedagogical approaches and implementations based on immersive user experiences in 3D MUVEs. It contributes to this field of education with three distinguished papers ranging from theoretical frameworks of user acceptance to training practices for skill development. The findings and suggestions in these papers will provide valuable insights for the academic community and for practitioners willing to benefit from the affordances of 3D MUVEs for learning purposes.

**Keywords**: Virtual reality, MUVEs, 3D environments, Blended learning, Metaverse

## 1. Introduction

Multi-user Virtual Environments (MUVEs) are structured with three-dimensional objects, allowing users to actively navigate their avatars through various areas within the immersive environment (Doğan et al., 2018). With the rapid evolution of educational technology and the rise of blended learning, 3D MUVEs have introduced new opportunities and challenges for pedagogies and instructional practices. Learning in 3D MUVEs is not a novel concept, but rather an approach that is continuously explored within the context of emerging learning paradigms such as social learning, game-based learning, gamification, and flipped classrooms. Information and Communication Technologies (ICT)s including service mashups, webGL/X3DOM, restful services, big data analysis, and various devices such as mobile and Virtual Reality (VR) devices have also been impacted (Stefan, 2015).

While MUVEs have been in use since the late 1970s under various names such as MUDs (Multi-User Dungeons) and MOOs (MUD Object-oriented) recent advancements in VR, Augmented Reality (AR), and blockchain technologies have significantly expanded their capabilities. These digital environments have gained significant prominence in education, offering dynamic, interactive, immersive, collaborative, and authentic learning experiences via new technologies. In 3D MUVEs, learners actively participate in constructing meaning from their experiences, while educators can implement learner-centered, constructivist pedagogical approaches that foster problem-solving and active learning (Marešová & Ecler, 2022). At the same time, 3D MUVEs require a blend of instructional and 3D design elements. These have proven to be most effective for "learning by designing," which engages users (Doğan et al., 2022). However, the use of 3D MUVEs can be difficult to implement due to its design-intensive and complex nature, which makes preparation challenging and time-consuming (Çınar et al., 2022).

With ill-structured instructional strategies, these environments risk becoming underutilized "Virtual Ghost Towns." In this context, both the tools used within these environments and the pedagogical approaches employed alongside them are of significant importance (Doğan & Tüzün, 2022). To fully utilize their capabilities, a deeper focus on instructional design, adaptive learning approaches, and usability improvements is necessary. From the user's perspective, 3D MUVEs are rich multimedia environments offering valuable pedagogical opportunities if well-structured and designed (Stefan et al., 2016). Displaying raw text in 3D MUVEs may be ineffective without proper formatting (Perera et al., 2011); therefore, integrating it with web-based resources such as chatbots and Artificial Intelligence (AI), along with immersive technologies like VR, may enhance blended learning by providing rich textual content and interactive access.

In this context, this special issue explores innovative pedagogical models and some practical implementation approaches for 3D MUVEs. With the rise of blended learning, focusing on integrating new technologies and strategies that enhance learner engagement and collaboration this special issue may provide some much-needed guidance. It addresses the challenges and opportunities of designing and using 3D MUVEs, highlighting the importance of effective instructional design, adaptive learning, and user-friendly interfaces. The goal is to provide insights into how to utilize 3D MUVEs to create dynamic, learner-centered environments and contribute to the knowledge about their role in modern education. This includes practical recommendations for successful implementation and sustainability.

## 2. This special issue

We, as a team of five guest editors, have worked around the clock to publish this special issue on time. Because of working in an esoteric field, despite all our promotion activities, only 14 academic papers (mostly from the Far East) were submitted for our special issue. The guest editors took advantage of this situation and scrutinized these papers with even greater effort. At least two reviewers as well as two editors gave detailed and iterative feedback for each paper in the special issue. For example, one paper was reviewed and revised six times. Since the guest editors were highly selective in accepting papers, five of them were rejected at the initial review, while six of them were rejected after an external review. Only three of them were accepted for publication in the end. As guest editors, we are indebted to all 19 reviewers for accepting the review invitation and submitting extensive constructive feedback despite their already-excessive workload and to all the authors, including those who submitted rejected ones, for giving us the opportunity to read their papers and for their patience and hard work. Below are the short summaries of the accepted articles.

The first article is "The use of virtual chatbots to support Chinese as a foreign language learners' communication skills through scaffolded self-directed learning." In that study, Lan et al. (2025) investigated the effectiveness of virtual chatbots that interact with and guide learners as needed, through authentic tasks in a 3D MUVE to improve their communication skills in learning Chinese as a Foreign Language (CFL). The study, which used a mixed methods approach, collected data from summative assessments in Moodle and chat logs in Second Life. The study group comprised 49 Chinese students at an Australian university. They had no previous experience learning Chinese. The scaffolded self-directed learning pathways implemented in the study not only improved the communication skills of CFL learners but also contributed to reducing vocabulary and sentence mistakes caused by their first language. Overall, the findings were satisfactory in terms of underpinning the importance of timely feedback and scaffolding through authentic experiences using virtual chatbots in a 3D MUVE for foreign language learning.

The second paper in the special issue is "Developing a multi-user virtual reality training system for emergency medical technicians: Determinants of acceptance and adoption." The paper focused on improving the medical preparedness of Emergency Medical Technicians (EMTs) using a multi-user VR training system. Chen et al. (2025) developed a VR training system to investigate the determinants influencing users' behavioral intention to adopt VR technology in the context of the Extended Unified Theory of Acceptance and Use of Technology (UTAUT 2). Research data were collected from 80 EMTs in eastern Taiwan. The predictive relationships between variables in the study, which adopted a correlational research design, were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The results indicated that performance expectancy, social influence, facilitating conditions, price value, and habits were the five factors influencing EMTs' adoption of a VR-based training system. Among these, performance expectations and facilitating conditions were found to be key determinants of VR adoption. Furthermore, facilitating conditions, habits and behavioral intention had a significant effect on usage behavior. In sum, the study provides important implications for the design and implementation of VR-based medical training metaverses to equip healthcare professionals with the competencies required to handle real-time emergency scenarios.

The applicability of 3D MUVEs, particularly in higher education, depends on the intention of the user, but the drivers and inhibitors that contribute to this intention remain unclear. In the last paper entitled "Student intention to use MUVEs: An integrated model of technology acceptance and learning engagement theories," Zhang et al. (2025) tested a composite model to examine the relationships between the constructs of perceived usefulness, perceived ease of use, and cognitive, emotional, and behavioral engagement influencing students' satisfaction and intention to use MUVEs. The structural model under scrutiny in that study was based on the Technology Acceptance Model (TAM) and Learning Engagement Theory. The study was conducted at a university in central China with the participation of 237 students using convenience sampling methods. The findings of the study indicated that perceived usefulness and ease of use had a significant impact on learning engagement. The study also highlighted the role of emotional engagement in student satisfaction with using technology. Interestingly, cognitive and behavioral engagement did not predict satisfaction. Another key finding in the study showed the importance of emotional engagement as a mediator between cognitive engagement and satisfaction, which ultimately influenced learners' intention to use MUVEs. Overall, the study has important implications for teachers, practitioners, and developers, revealing the need for an in-depth understanding of the pivotal role of emotions in enhancing the efficacy and satisfaction of learning processes in MUVEs.

## 3. Conclusion

While preparing this special issue, we have gained several insights that we are excited to share with our readers to encourage future research. First, when we decided to submit a proposal for this special issue to the ET&S journal in 2023, the metaverse, essentially 3D MUVEs, and AI were perceived as breakthroughs in the education community. However, over the past few years, we have realized that interest in metaverses pales in comparison to interest in AI at the time of publishing this special issue. However, 3D MUVEs continue to play a critical role, especially in distance and online education.

The Gartner Hype Cycle (Gartner, 2018), widely used to understand how new technologies are adopted, describes five stages: Technology Trigger, Peak of Inflated Expectations, Trough of Disillusionment, Slope of Enlightenment, and Plateau of Productivity. Initially, 3D MUVEs were at the Peak of Inflated Expectations, surrounded by enthusiasm and high hopes, especially in education. However, the technology was still immature and challenging for many users. As expectations dropped, 3D MUVEs entered the Trough of Disillusionment, a stage marked by disappointment replacing earlier optimism. Although their educational potential began to be seen more clearly, perceptions remained cautious and critical. This led to more realistic and planned approaches to their use in educational settings.

According to the Technology Adoption Lifecycle model, 3D MUVEs can initially be considered a technology adopted by "Innovators" and "Early Adopters." These early adopters are the group that start to leverage the potential of the technology and often try to explore new ways of teaching and learning. However, for broader acceptance and widespread use, the transition to the "Early Majority" phase is necessary. This stage marks the period when 3D MUVEs begin to gain widespread acceptance in education, and educators and learners begin to recognize the potential for creating interactive, application-based environments.

In recent years, particularly with the integration of innovative technologies like AI, VR, and AR, 3D MUVEs have become more widespread and sustainable in education. These technologies have significantly expanded the role of 3D MUVEs in education, enhancing their capacity to offer personalized and interactive learning experiences. This evolution suggests that the technology adoption process is nearing the "Plateau of Productivity" phase.

In the future, to enhance the effectiveness of 3D MUVEs in education, a large body of research focusing on pedagogical and technological design approaches will be necessary. It is important to focus on areas such as teaching materials, content production, and technical infrastructure to ensure the sustainability and widespread use of these environments, to meet the needs of users, educators, and learners. As these technologies become more prevalent, they will create more efficient and sustainable application spaces in the coming years. The role of 3D MUVEs in education will evolve into a critical element for creating interactive and student-centered learning environments.

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