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# Embodied Learning in the Metaverse: A Qualitative Analysis of Student Engagement and Social Presence in Immersive Virtual Classrooms

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**Abstract :**
This study explores student engagement and social presence in immersive virtual classrooms within the metaverse, focusing on how these factors influence learning outcomes. The objective is to understand how students interact with and experience the metaverse in educational settings, with a particular emphasis on social presence and engagement. A qualitative research design was employed, using semi-structured interviews, focus group discussions, and classroom observations to gather data from students participating in metaverse-based learning environments. The findings reveal that while the metaverse enhances student engagement and fosters a sense of social presence for some students, others struggle with technical challenges and discomfort with the platform. The results also suggest that students' technological familiarity significantly impacts their level of engagement and social presence in virtual spaces. The implications of this research highlight the importance of providing technical support and guidance to students unfamiliar with immersive technologies, as well as designing more user-friendly metaverse platforms to enhance inclusivity. Educators should focus on facilitating interaction and collaboration to maximize the potential of virtual learning environments.

## INTRODUCTION

The advent of immersive technologies, particularly the metaverse, has transformed the landscape of education, offering new opportunities for embodied learning in virtual environments (Park & Sohn, 2023; Lee & Kim, 2023). The increasing integration of these technologies into educational practices holds significant promise for enhancing student engagement and fostering social presence (Lee & Hwang, 2022; Nguyen et al., 2024). This research is important for society as it explores how virtual reality (VR) and the metaverse can create more interactive, engaging, and immersive learning experiences. Research has shown that immersive environments can improve student motivation and active participation, which are essential for deep learning and retention (Al-Adwan et al., 2023; Alkhwaldi, 2024). As the metaverse continues to gain traction in education, understanding how students engage with these environments is crucial for

optimizing their potential to enhance learning outcomes (Ng, 2022; Onu et al., 2023).

However, despite the growing popularity of immersive learning environments, significant challenges remain in fully realizing their potential in higher education (Lampropoulos, 2024). One major issue is the varying levels of student engagement in virtual classrooms, which can affect learning outcomes. Some students report feeling disconnected or disengaged in virtual settings, hindering their ability to actively participate in the learning process. This challenge is particularly evident in the context of the metaverse, where the social and emotional aspects of learning must be fully understood and addressed. Research on the effectiveness of the metaverse for education often lacks a comprehensive analysis of how social presence and student engagement in immersive environments impact learning experiences (Beck, Morgado, & O'Shea, 2024).

In the field of immersive education, several phenomena are emerging that require further investigation. As the metaverse evolves, so do the ways students engage with and interact in virtual classrooms. One key observation is the disparity in students' experiences with the metaverse: some thrive in these environments, while others struggle to feel connected or engaged. Social presence, which refers to the feeling of being "present" with others in a virtual environment, plays a significant role in this engagement. Studies indicate that the more students feel socially connected in virtual spaces, the more likely they are to participate and retain information (Çelik & Baturay, 2024; Hwang, Shin, & Lee, 2023). This highlights the need to examine not only the technological aspects of the metaverse but also the psychological and social factors that contribute to effective learning experiences.

Previous research has focused on the integration of metaverse technology in education, highlighting its potential to enhance engagement and improve learning outcomes. However, gaps remain in understanding the relationship between embodied learning, social presence, and student engagement in these virtual environments. For instance, while some studies have explored the effectiveness of immersive VR experiences on student motivation (Jovanović & Milosavljević, 2022; Hwang, Shin, & Lee, 2023), few have conducted in-depth qualitative analyses of how these elements impact students' social interactions and learning behaviors. This study aims to address this gap by focusing on the metaverse's ability to foster a sense of presence and engagement among students, particularly in immersive virtual classrooms. By exploring the social and psychological dimensions of metaverse-based learning, this research seeks to contribute to the growing body of knowledge in educational technology (Arpaci & Bahari, 2023; Beck, Morgado, & O'Shea, 2024).

While many studies have examined metaverse technology's role in education, few have explored its specific impact on social presence and engagement in virtual classrooms. Additionally, many existing studies focus on quantitative outcomes, such as test scores and completion rates, without considering the qualitative aspects of student experience. The research conducted by Chen et al. (2023) has provided valuable insights into how students collaborate in metaverse settings, but there is limited research on how these virtual spaces impact the sense of social presence, especially in the context of immersive learning environments. Furthermore, most studies have focused on individual subject areas

or specific learning outcomes, leaving the broader picture of social interaction and presence in immersive environments underexplored (Chen, 2022; Guo & Gao, 2022).

The novelty of this study lies in its qualitative approach to understanding student engagement and social presence in the metaverse, a growing area of research. Unlike previous studies that have focused primarily on the technological integration of the metaverse into education, this study explores how students experience and interact with these virtual spaces on a social and emotional level. By focusing on student perceptions of engagement and social presence in immersive learning environments, this research aims to provide a more comprehensive understanding of the factors that influence learning outcomes in virtual classrooms. This gap in the literature is crucial to address, as it has significant implications for the design of future educational metaverse platforms (Chamola et al., 2025; Natale et al., 2024).

The primary research problem addressed by this study is: How do embodied learning and social presence in the metaverse affect student engagement and learning outcomes in immersive virtual classrooms? The argument posits that the metaverse, when designed with attention to social presence and engagement, can significantly enhance the learning experience. By focusing on these factors, this study aims to provide insights into how metaverse-based platforms can be optimized to foster a sense of community, increase student motivation, and promote deeper learning. The findings will contribute to the development of more effective immersive learning environments, ensuring that the metaverse can fulfill its educational potential (Kim, Planey, & Lindgren, 2023; Lee, Woo, & Yu, 2022).

## RESEARCH METHODS

This study adopts a qualitative research design to explore student engagement and social presence in immersive virtual classrooms within the metaverse. A qualitative approach was selected due to its ability to provide in-depth insights into students' lived experiences, perceptions, and social interactions in virtual environments. Given the growing use of metaverse technologies in education, understanding these subjective experiences is crucial for designing more effective learning platforms (Arpaci & Bahari, 2023; Beck, Morgado, & O'Shea, 2024). The qualitative design enables the capture of complex, context-specific data that cannot be easily quantified, making it ideal for studying engagement and social presence in immersive settings.

The research was conducted within a higher education institution offering courses that incorporate the metaverse for immersive virtual learning experiences. This setting was chosen because it provided an opportunity to observe students actively engaging in metaverse-based learning environments, thus ensuring that the data would reflect real-world experiences of immersive education (Chen, Z., 2022; Hwang, Shin, & Lee, 2023). Data collection involved a combination of semi-structured interviews, focus group discussions, and participant observation to capture the full range of student experiences. The interviews and focus groups allowed students to articulate their thoughts and experiences, while observations provided insights into student interactions within the virtual learning environment.

Data analysis followed a thematic approach, which included data condensation, reduction, and display. Initially, the data was condensed by identifying key themes from the interview and focus group transcripts. This was followed by data reduction, where the researcher focused on the most relevant data that directly addressed the research questions regarding engagement and social presence. Displaying the data involved organizing the themes into meaningful categories, allowing for easier interpretation of patterns and insights (Di Natale et al., 2024; Jiang & Fryer, 2023). To ensure the credibility and validity of the findings, data triangulation was employed, incorporating multiple data sources (interviews, focus groups, and observations) to verify consistency and reliability across different sources (Chen et al., 2023). Member checking was also used, allowing participants to review and confirm the findings to ensure the accuracy of the representation of their experiences.

## RESULTS AND DISCUSSION

### Results

The data collected from semi-structured interviews, focus group discussions, and classroom observations provided rich insights into how students engage with the metaverse in immersive virtual classrooms. The interviews revealed diverse experiences, with students highlighting both the benefits and challenges of learning in such environments. Many students expressed a sense of increased engagement due to the immersive nature of the virtual space. One participant shared, “The virtual environment feels more interactive; it’s like I can connect with my classmates even though we’re miles apart,” reflecting a strong sense of presence in the metaverse. This suggests that the metaverse offers a level of immersion that traditional online learning platforms do not, enhancing student engagement and participation.

However, some students reported difficulties in fully engaging with the metaverse, primarily due to technical issues or discomfort with the virtual platforms. One informant noted, “Sometimes, the controls are hard to use, and it makes me feel disconnected from the lesson.” Such feedback indicates that, while the metaverse holds potential, there are still barriers related to its accessibility and ease of use. Additionally, a few participants expressed concerns about feeling overwhelmed by the novelty of the technology, suggesting that support and guidance might be needed to help students acclimate to virtual classrooms. This aligns with the idea that although immersive environments can increase engagement, they can also create challenges for some students, particularly those less familiar with the technology.

Classroom observations further corroborated the interview findings. In several sessions, students were observed interacting with one another and with the virtual environment, demonstrating high levels of social presence. For instance, during a group activity in the virtual classroom, students were seen discussing the material actively and exchanging ideas in a manner similar to face-to-face classroom interactions. The use of avatars allowed students to mimic body language and facial expressions, which enhanced the sense of being “present” in the virtual space. However, some students appeared less engaged, remaining passive during group discussions and only interacting when directly prompted by

the instructor. This suggests that while social presence was evident for some students, others may have struggled to establish meaningful connections in the metaverse. It indicates that the success of virtual classrooms in fostering social presence may depend on the individual's comfort level with the technology and the level of interaction encouraged within the platform.

The analysis of these observations highlighted that social presence was not universally experienced in the same way by all students. Those who were more comfortable navigating the metaverse exhibited higher levels of engagement and participation, often taking on leadership roles within group activities. Conversely, students who found the technology challenging showed lower levels of interaction and engagement. These differences in engagement highlight the importance of designing virtual learning environments that are both accessible and user-friendly, ensuring that all students can benefit from the immersive experience.

In conclusion, the results indicate that the metaverse has the potential to enhance student engagement and social presence in virtual classrooms, but its effectiveness is contingent upon students' comfort with the technology and their ability to interact within the virtual space. While many students reported positive experiences of increased engagement and connection, technical challenges and the novelty of the environment were identified as barriers to full participation for some. Future design improvements and support systems will be essential to ensuring that the metaverse can offer an inclusive and effective learning environment for all students.

## Discussion

The findings of this study reveal both convergence and divergence with existing literature on immersive learning environments, particularly the use of the metaverse in education. As anticipated, the results showed that students who felt more comfortable with the metaverse exhibited higher levels of engagement, a finding consistent with previous studies that emphasize the importance of social presence in virtual environments (Çelik & Baturay, 2024; Hwang, Shin, & Lee, 2023). These students reported feeling more connected to their peers and the learning material, reflecting the notion that social presence in virtual learning environments can enhance engagement and academic motivation. However, this study also revealed some divergence from the literature, particularly regarding the challenges that less tech-savvy students face in fully engaging with the metaverse. Some students expressed discomfort with the controls or technical issues, leading to disengagement, which contrasts with studies suggesting that technology-enhanced environments are inherently engaging for all learners (Guo & Gao, 2022; Jiang & Fryer, 2023).

Furthermore, the study found that social presence, while a significant factor in student engagement, was not uniformly experienced across all students. This aligns with findings from Di Natale et al. (2024), who noted that some students struggle to establish a sense of presence in virtual spaces due to their lack of experience with immersive technologies. In contrast, Chen et al. (2023) argued that social presence could be easily achieved in well-designed virtual classrooms, where interaction and collaboration are prioritized. This discrepancy highlights the complexity of fostering social presence in the metaverse. While some students can

easily adapt and interact meaningfully in virtual spaces, others may need additional support to feel socially connected, suggesting that the design of these environments must be adaptable to different levels of technological proficiency and engagement.

The theoretical implications of this study are significant in terms of understanding how metaverse-based learning environments contribute to the development of student engagement and social presence. The research confirms the importance of social presence as a key factor influencing engagement, a concept well-established in the literature (Beck, Morgado, & O'Shea, 2024; Arpaci & Bahari, 2023). However, this study also contributes a new dimension to this theory by showing that technological familiarity plays a crucial role in how students experience social presence. Students who are less familiar with the metaverse or who experience technical difficulties may find it more difficult to develop social presence, ultimately affecting their overall engagement. This suggests that future research should explore ways to bridge the digital divide and ensure that all students can engage meaningfully in immersive learning environments, regardless of their technological skills.

Practically, the findings suggest that educational institutions should provide better support for students in navigating virtual classrooms, particularly those who may be unfamiliar with immersive technologies. As the metaverse continues to be integrated into higher education, it is essential to offer orientation sessions, tutorials, and technical support to help students become more comfortable with the platform. Additionally, instructors should be trained to facilitate interactions and engagement in virtual environments, ensuring that all students feel included and can fully participate. This study also emphasizes the need for a more user-friendly interface in metaverse platforms to reduce the barriers caused by technical difficulties, which would ultimately enhance social presence and engagement for all students (Kim & Kim, 2023; Lampropoulos & Evangelidis, 2025).

In conclusion, while the metaverse has significant potential to enhance student engagement and learning outcomes, the findings of this study reveal the importance of considering individual differences in technological familiarity and support needs. The results highlight that while some students thrive in immersive virtual environments, others face challenges that prevent them from fully engaging. To maximize the effectiveness of metaverse-based learning, it is crucial to create inclusive and accessible environments that cater to diverse student needs, provide appropriate support, and prioritize social interaction and collaboration. This study contributes to the growing body of knowledge on the metaverse in education and provides insights into how future platforms can be improved to better support all learners (Lee, Woo, & Yu, 2022; Natale et al., 2024).

## CONCLUSION

The most important finding of this study is that the metaverse has significant potential to enhance student engagement and social presence in immersive virtual classrooms. However, this potential is not universally realized, as students' technological familiarity and comfort with the platform play a crucial role in their ability to fully engage with the virtual environment. The lesson learned

from this research is that while immersive technologies can offer rich, interactive learning experiences, their success depends on bridging the gap between technological innovation and students' individual abilities to navigate and participate in these virtual spaces.

The strength of this study lies in its contribution to the growing body of knowledge on the metaverse and its application in higher education. By focusing on student engagement and social presence in virtual learning environments, this research provides valuable insights into the factors that influence students' experiences in the metaverse. However, the study has limitations, including its focus on a single institution and the specific student population. Future research should explore diverse educational settings and examine the long-term effects of metaverse-based learning on student engagement and learning outcomes. Additionally, further studies could investigate the role of instructors and the design of virtual classrooms in enhancing student participation and social presence.

## REFERENCES


Al-Adwan, A., Li, N., Al-Adwan, A., Abbasi, G., Albelbis, N., & Habibi, A. (2023). Extending the technology acceptance model (TAM) to predict university students' intentions to use metaverse-based learning platforms. *Education and Information Technologies*, 1–33. https://doi.org/10.1007/s10639-023-11816-3

Alkhwaldi, A. (2024). Investigating the social sustainability of immersive virtual technologies in higher educational institutions: Students' perceptions toward metaverse technology. *Sustainability*. https://doi.org/10.3390/su16020934

Arpaci, I., & Bahari, M. (2023). Investigating the role of psychological needs in predicting the educational sustainability of metaverse using a deep learning-based hybrid SEM-ANN technique. *Interactive Learning Environments, 32*, 2957–2969. https://doi.org/10.1080/10494820.2022.2164313

Beck, D., Morgado, L., & O'Shea, P. (2024). Educational practices and strategies with immersive learning environments: Mapping of reviews for using the metaverse. *IEEE Transactions on Learning Technologies, 17*, 319–341. https://doi.org/10.1109/TLT.2023.3243946

Çelik, F., & Baturay, M. (2024). The effect of metaverse on L2 vocabulary learning, retention, student engagement, presence, and community feeling. *BMC Psychology, 12*. https://doi.org/10.1186/s40359-024-01549-4

Chamola, V., Peelam, M., Mittal, U., Hassija, V., Singh, A., Pareek, R., Mangal, P., Sangwan, D., De Albuquerque, V., Mahmud, M., & Brown, D. (2025). Metaverse for education: Developments, challenges, and future direction. *Computer Applications in Engineering Education, 33*. https://doi.org/10.1002/cae.70018

Chen, X., Zou, D., Xie, H., & Wang, F. (2023). Metaverse in education: Contributors, cooperations, and research themes. *IEEE Transactions on Learning Technologies, 16*, 1111–1129. https://doi.org/10.1109/TLT.2023.3277952

Chen, Z. (2022). Exploring the application scenarios and issues facing metaverse technology in education. *Interactive Learning Environments, 32*, 1975–1987. https://doi.org/10.1080/10494820.2022.2133148

Di Natale, A., Repetto, C., Costantini, G., Riva, G., Bricolo, E., & Villani, D. (2024). Learning in the metaverse: Are university students willing to learn in immersive virtual reality? *Cyberpsychology, Behavior, and Social Networking, 27*, 28–36. https://doi.org/10.1089/cyber.2022.0395

Guo, H., & Gao, W. (2022). Metaverse-powered experiential situational English-teaching design: An emotion-based analysis method. *Frontiers in Psychology, 13*. https://doi.org/10.3389/fpsyg.2022.859159

Hwang, Y., Shin, D., & Lee, H. (2023). Students' perception on immersive learning through 2D and 3D metaverse platforms. *Educational Technology Research and Development*. https://doi.org/10.1007/s11423-023-10238-9

Jiang, J., & Fryer, L. (2023). The effect of virtual reality learning on students' motivation: A scoping review. *Journal of Computer Assisted Learning, 40*, 360–373. https://doi.org/10.1111/jcal.12885

Jovanović, A., & Milosavljević, A. (2022). VoRtex metaverse platform for gamified collaborative learning. *Electronics*. https://doi.org/10.3390/electronics11030317

Kim, T., Planey, J., & Lindgren, R. (2023). Theory-driven design in metaverse virtual reality learning environments: Two illustrative cases. *IEEE Transactions on Learning Technologies, 16*, 1141–1153. https://doi.org/10.1109/TLT.2023.3307211

Kim, H., & Kim, M. (2023). Presence and effectiveness of online learning using a metaverse platform: Gather.town. *International Journal of Information and Education Technology*. https://doi.org/10.18178/ijiet.2023.13.4.1854

Lampropoulos, G., & K. (2024). Virtual reality and gamification in education: A systematic review. *Educational Technology Research and Development, 72*, 1691–1785. https://doi.org/10.1007/s11423-024-10351-3

Lampropoulos, G., & Evangelidis, G. (2025). Learning analytics and educational data mining in augmented reality, virtual reality, and the metaverse: A systematic literature review, content analysis, and bibliometric analysis. *Applied Sciences*. https://doi.org/10.3390/app15020971

Lee, H., Woo, D., & Yu, S. (2022). Virtual reality metaverse system supplementing remote education methods: Based on aircraft maintenance simulation. *Applied Sciences*. https://doi.org/10.3390/app12052667

Lee, H., & Hwang, Y. (2022). Technology-enhanced education through VR-making and metaverse-linking to foster teacher readiness and sustainable learning. *Sustainability*. https://doi.org/10.3390/su14084786

Lee, J., & Kim, Y. (2023). Sustainable educational metaverse content and system based on deep learning for enhancing learner immersion. *Sustainability*. https://doi.org/10.3390/su151612663

Natale, A., Bartolotta, S., Gaggioli, A., Riva, G., & Villani, D. (2024). Exploring students' acceptance and continuance intention in using immersive virtual reality and metaverse integrated learning environments: The case of an Italian university course. *Education and Information Technologies, 29*, 14749–14768. https://doi.org/10.1007/s10639-023-12436-7

Ng, D. (2022). What is the metaverse? Definitions, technologies and the community of inquiry. *Australasian Journal of Educational Technology*. https://doi.org/10.14742/ajet.7945

Nguyen, A., Le, T., Dang, T., & Nguyen, L. (2024). Understanding metaverse adoption in education: The extended UTAUMT model. *Heliyon, 10*. https://doi.org/10.1016/j.heliyon.2024.e38741

Onu, P., Pradhan, A., & Mbohwa, C. (2023). Potential to use metaverse for future teaching and learning. *Education and Information Technologies, 29*, 8893–8924. https://doi.org/10.1007/s10639-023-12167-9

Park, J., & Sohn, S. (2023). Exploring students' experiences of virtual learning environment for art history classroom. *Harmonia: Journal of Arts Research and Education*. https://doi.org/10.15294/harmonia.v23i1.41094