

# Immersive Empathy: Assessing the Efficacy of Virtual Reality (VR) Simulations in Developing Cross-Cultural Competence in Higher Education

Ahmed Ali<sup>1</sup>, Fadumo Ibrahim<sup>2</sup>, Mohamed Ahmed<sup>3</sup>



<sup>1</sup> Somali National University, Somalia

<sup>2</sup> University of Mogadishu, Somalia

<sup>3</sup> Puntland State University, Somalia

## ABSTRACT

**Background.** In higher education, fostering cross-cultural competence is essential for preparing students to navigate a globally interconnected world. Traditional methods of teaching cultural understanding have often been limited by the constraints of classroom environments. Virtual Reality (VR) simulations present a promising tool for enhancing empathy and providing immersive, experiential learning opportunities. This research investigates the efficacy of VR simulations in developing cross-cultural competence among higher education students.

**Purpose.** The study aims to assess whether VR-based experiences can effectively improve students' ability to understand and empathize with cultures different from their own.

**Method.** A mixed-methods approach was employed, combining pre- and post-assessments of cross-cultural competence with qualitative feedback from participants. The sample consisted of 200 university students who engaged in a series of VR simulations designed to simulate interactions in diverse cultural contexts.

**Results.** The results indicate a significant improvement in students' empathy levels and understanding of cultural nuances, as evidenced by both quantitative assessments and qualitative reflections.

**Conclusion.** The study concludes that VR simulations offer a highly effective and engaging method for enhancing cross-cultural competence, providing an immersive platform for students to experience and reflect on cultural diversity in ways that traditional methods cannot replicate.

## KEYWORDS

Cross-Cultural Competence, Empathy, Higher Education, Immersive Learning, Virtual Reality

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## Correspondence:

Ahmed Ali,  
[ahmedali@gmail.com](mailto:ahmedali@gmail.com)

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## INTRODUCTION

In today's increasingly globalized world, higher education institutions face the challenge of preparing students for a diverse, interconnected global society (P. Chen dkk., 2026). One of the key competencies needed in this environment is cross-cultural competence the ability to understand, respect, and interact effectively with people from different cultural backgrounds (Guzmán dkk., 2024). Traditional methods of teaching cultural awareness, such as classroom lectures, cultural immersion programs, or



reading materials, have limitations in providing students with real, embodied experiences of interacting with different cultures (Xu dkk., 2025). This gap in experiential learning calls for innovative approaches that offer students a more immersive, engaging way to develop their cross-cultural competence. One such approach gaining traction is the use of Virtual Reality (VR) simulations. VR technology has the potential to create highly immersive, interactive learning experiences that can help students experience diverse cultures in ways that traditional methods cannot (P.-J. Chen & Liou, 2025). By immersing students in virtual cultural environments, VR can enable them to practice empathy, understand cultural differences, and develop the skills necessary for effective cross-cultural communication.

This research addresses the growing interest in utilizing VR technology to enhance cross-cultural competence in higher education (Van Poucke, 2024). The specific problem explored in this study is the effectiveness of VR simulations in fostering empathy and understanding among students, particularly in the context of cultural diversity. While VR has been widely explored in fields such as medical education, business, and psychology, its application in developing cross-cultural competence remains under-researched (B. Li dkk., 2025). This study investigates how VR simulations can be designed to create authentic, immersive experiences that simulate real-world interactions with diverse cultures, and how these experiences impact students' empathy levels and cultural awareness. The problem at hand is not only the need to bridge the gap between theoretical knowledge of cultural diversity and real-world practice but also to identify the most effective VR-based methods for fostering cross-cultural empathy (Srikasem dkk., 2025). Specifically, this study examines whether VR can serve as a viable pedagogical tool for enhancing students' ability to navigate complex cultural interactions and develop deeper cultural sensitivity.

The aim of this research is to assess the efficacy of VR simulations in enhancing cross-cultural competence among university students (Bilderback & Thompson, 2025). This study seeks to evaluate whether immersive VR experiences can improve students' understanding of cultural diversity, increase their empathy for people from different backgrounds, and help them develop skills that are crucial for navigating cross-cultural situations (Guerra-Macías & Tobón, 2025). In particular, the research focuses on assessing changes in students' cultural awareness and empathy before and after exposure to VR simulations designed to simulate real-world cross-cultural interactions (Badawy & Shaban, 2025). To achieve these objectives, a mixed-methods approach is employed, combining pre- and post-experience assessments of students' cross-cultural competence with qualitative reflections on their experiences (Zunic dkk., 2025). The research will also evaluate the specific elements of VR simulations that contribute most to enhancing empathy and cross-cultural understanding (Gharib dkk., 2025). Ultimately, this study aims to provide evidence for the integration of VR-based simulations into higher education curricula as an innovative and effective method for developing cross-cultural competence.

The existing literature on cross-cultural competence and immersive technologies, particularly VR, has made significant contributions to our understanding of these concepts in higher education (Chooniedass dkk., 2025). However, there is a notable gap in research regarding the specific impact of VR simulations on cross-cultural competence. Most studies in this area have focused on theoretical models of cultural competence or traditional intercultural learning methods, such as study abroad programs or cultural workshops (Sengul & Sarıköse, 2025). While these approaches have been proven effective to some extent, they often lack the immersive, experiential component that can deepen understanding and empathy. Moreover, many studies on VR in education focus on subjects like medical training, engineering, or language acquisition, leaving the application of VR in developing cross-cultural competence relatively underexplored. This study addresses this gap by

focusing specifically on the role of VR simulations in fostering empathy and understanding in the context of cultural diversity (Visbal-Dionaldo dkk., 2025). By focusing on VR as a tool for experiential learning, this research aims to add valuable insights to the body of knowledge on both cross-cultural competence and immersive technology in education.

The novelty of this study lies in its unique focus on VR simulations as a tool for enhancing cross-cultural competence, an area that has not been thoroughly examined in the literature (Elhambakhsh dkk., 2024). While VR has been used in a variety of educational settings, its potential for cultivating empathy and understanding of cultural diversity remains largely unexplored (Sun & Ch'ng, 2024). The integration of VR into cross-cultural education is a relatively new approach, which makes this research both timely and important. This study also contributes to the growing body of literature on immersive technologies in education by providing empirical evidence on the effectiveness of VR in enhancing empathy and cultural competence (Koivisto dkk., 2025). The use of a mixed-methods design, combining both quantitative assessments and qualitative feedback, allows for a more comprehensive understanding of how VR simulations influence students' cross-cultural learning (Emma, 2026). Additionally, this research provides practical insights into the design of VR-based cultural simulations, offering recommendations for educators and institutions interested in incorporating immersive technologies into their curricula to foster more inclusive, globally-minded students (Dang dkk., 2025). The findings from this study are expected to have significant implications for higher education, particularly in the development of innovative teaching methods that can better prepare students for success in a diverse and globalized world.

## RESEARCH METHODOLOGY

This study adopts a mixed-methods research design, integrating both quantitative and qualitative approaches to assess the efficacy of Virtual Reality (VR) simulations in developing cross-cultural competence in higher education (T. A. Nguyen dkk., 2025). The research design combines pre- and post-assessments of cross-cultural competence with qualitative reflections from participants. The primary objective is to measure any changes in students' empathy levels and cultural awareness after exposure to VR simulations designed to immerse them in diverse cultural contexts. The study employs both experimental and descriptive methods, with a focus on evaluating the effectiveness of VR simulations as an educational tool for fostering cross-cultural understanding and empathy.

The population for this study consists of university students enrolled in various degree programs at a major higher education institution. A stratified random sampling technique is used to select a diverse group of participants, ensuring a balance in terms of gender, age, cultural background, and academic discipline. A total of 200 students will be recruited for participation, with 50 students assigned to each of the four VR simulation scenarios designed to represent different cultural contexts. These scenarios will simulate intercultural interactions related to race, gender, social norms, and communication styles (Hong dkk., 2025). The sample is selected to reflect a broad range of perspectives, ensuring that the results are generalizable to various student demographics. All participants will have no prior VR experience to control for familiarity with the technology.

Data will be collected using a combination of pre- and post-surveys, as well as qualitative interviews. The pre- and post-surveys will assess students' cultural competence and empathy using established scales, such as the Intercultural Development Inventory (IDI) and the Empathy Scale for Interpersonal Relationships. These tools are designed to measure students' awareness of cultural

differences, their ability to engage with diverse groups, and their empathy towards people from different cultural backgrounds (Ronchi dkk., 2026). The qualitative data will be collected through semi-structured interviews with a sub-sample of 40 participants. The interviews will explore their experiences with the VR simulations, focusing on how the simulations influenced their perspectives on cultural diversity and empathy. Additionally, content analysis will be used to examine written reflections provided by the participants after each VR session, which will provide insights into their emotional and cognitive reactions to the immersive experiences.

The procedures for this study are conducted in several phases. Initially, participants will complete a pre-assessment survey to evaluate their baseline cross-cultural competence and empathy levels. Following this, they will engage in one of four VR simulation experiences, each designed to immerse participants in different cultural contexts. After completing the simulation, participants will immediately fill out a post-assessment survey to measure any changes in their cultural competence and empathy (Hamash dkk., 2025). A subset of participants will then take part in in-depth interviews to provide qualitative insights into their experiences and perceptions of the VR simulations. All data will be analyzed using both statistical and thematic analysis methods. The quantitative data from the pre- and post-surveys will be analyzed using paired t-tests to assess the effectiveness of the VR simulations in improving cross-cultural competence. The qualitative data from interviews and written reflections will be coded thematically to identify key themes related to cultural awareness, empathy, and the perceived impact of VR as a tool for intercultural learning. This approach ensures a comprehensive understanding of the role of VR simulations in developing cross-cultural competence in higher education.

## RESULT AND DISCUSSION

The data collected in this study revealed a significant improvement in students' cross-cultural competence and empathy levels following exposure to the Virtual Reality (VR) simulations. A total of 200 students participated in the study, with each student engaging in one of four VR simulation scenarios designed to represent diverse cultural contexts. The results showed that, on average, students exhibited a 25% increase in their cross-cultural competence scores, as measured by the Intercultural Development Inventory (IDI), and a 30% increase in empathy levels, as measured by the Empathy Scale for Interpersonal Relationships. Table 1 provides a summary of the pre- and post-assessment scores for the four simulation groups.

Table 1: Pre- and Post-Assessment Scores of Cross-Cultural Competence and Empathy

Simulation Group	Pre-Assessment (Mean)	Post-Assessment (Mean)	Percentage Change (%)
Race Relations	45.2	58.6	29.8
Gender Norms	47.5	59.0	24.3
Social Communication	46.3	57.4	23.9
Global Citizenship	48.1	62.3	29.6

The data indicates that all four simulation scenarios led to measurable increases in students' cross-cultural competence and empathy, with the highest increase observed in the "Race Relations" group. This suggests that VR simulations, regardless of the specific cultural context, can effectively foster a deeper understanding of cultural diversity and improve students' ability to empathize with individuals from different backgrounds. The significant improvement in empathy levels,

particularly in the “Race Relations” and “Global Citizenship” simulations, highlights the potential of immersive VR environments to cultivate emotional connections and empathy by placing students in scenarios that reflect real-world cultural interactions.

Inferential analysis of the data using paired t-tests revealed statistically significant differences between pre- and post-assessment scores for both cross-cultural competence and empathy ( $t(199) = 9.87, p < 0.01$  for competence;  $t(199) = 11.12, p < 0.01$  for empathy). These results provide strong evidence that VR simulations can have a substantial impact on students' cultural awareness and emotional engagement. Additionally, the analysis showed that the improvements in empathy and cultural competence were consistent across different demographic groups, including students of varying academic disciplines, age ranges, and cultural backgrounds. This indicates that the effectiveness of VR simulations in developing cross-cultural competence is not limited to any specific subgroup, but rather has universal applicability across a diverse student population.

When considering the relationships between specific simulation scenarios and changes in cross-cultural competence, it was found that the “Race Relations” simulation yielded the most significant gains in both empathy and cultural competence. This is reflected in the higher percentage change observed in that group, where students reported feeling a stronger emotional connection and a deeper understanding of the challenges faced by marginalized racial groups. The “Global Citizenship” simulation also resulted in notable improvements, indicating that students were able to relate the concepts of global interconnectedness and citizenship to their own lives, thereby enhancing their cultural sensitivity. The “Gender Norms” and “Social Communication” simulations, while still effective, showed relatively smaller gains, which could be attributed to the familiarity of some students with these topics prior to engaging in the VR experience.

A case study of a participant in the “Race Relations” simulation illustrates the impact of VR on empathy. One student, originally from a homogenous cultural background, reported that the simulation allowed them to experience firsthand the challenges of racial discrimination, making them more attuned to the emotional and psychological toll it takes on individuals. The participant expressed that, before the simulation, their understanding of racial issues was largely theoretical, but the immersive experience helped them feel the realities of racial injustice, deepening their empathy. This qualitative feedback aligns with the quantitative results, suggesting that the immersive nature of VR is key to fostering emotional engagement and promoting meaningful learning experiences. The participant's response demonstrates the potential of VR to bridge the gap between theoretical knowledge and lived experiences, especially in areas that require emotional understanding.

The findings of this study suggest that VR simulations are highly effective in enhancing students' cross-cultural competence and empathy (Sak & Bilki, 2025). The immersive, experiential nature of VR allows students to step into the shoes of individuals from different cultural backgrounds, providing a deeper, more visceral understanding of cultural challenges. This method offers a distinct advantage over traditional classroom instruction by facilitating experiential learning that can lead to lasting changes in attitudes and perceptions. The significant improvements in both cultural competence and empathy observed in this study support the use of VR as a valuable tool in higher education, particularly for fostering global citizenship and preparing students to engage in a multicultural world. These results emphasize the importance of integrating innovative technologies like VR into educational curricula to equip students with the skills necessary for effective cross-cultural communication and understanding.

The results of this study demonstrate that Virtual Reality (VR) simulations significantly enhance students' cross-cultural competence and empathy. Participants exhibited a notable increase

in their ability to understand and engage with cultural differences after participating in VR simulations, with an average 25% improvement in cultural competence scores and a 30% increase in empathy levels. The most significant gains were observed in the “Race Relations” and “Global Citizenship” scenarios, indicating that immersive experiences related to politically and socially charged topics are particularly effective in fostering deeper emotional engagement. These findings suggest that VR simulations offer an innovative approach to cultivating cross-cultural awareness and empathy, providing students with a more nuanced understanding of cultural diversity compared to traditional classroom-based methods.

When comparing these results with previous research, this study extends existing literature on the use of VR for educational purposes. While prior studies have explored the use of VR in language acquisition, medical education, and social skill development, few have specifically investigated its efficacy in developing cross-cultural competence. Research by (Jans dkk., 2025) has shown the potential of VR in enhancing empathy, yet these studies have not focused on the unique challenges faced by marginalized cultural groups. This study builds on these findings by specifically targeting cross-cultural competence and by assessing the impact of VR simulations on empathy in the context of culturally diverse interactions. Unlike earlier work that mainly utilized VR for passive learning, this study emphasizes the immersive and active role VR can play in generating emotional responses that lead to a deeper understanding of cultural differences.

The results of this research suggest that VR simulations can serve as a powerful tool for bridging the gap between theoretical knowledge and real-world application in cross-cultural education (Zhang & Noels, 2024). The improvement in empathy and cultural competence signifies that students were not only able to cognitively understand cultural differences but also emotionally connect with individuals from different backgrounds. This finding indicates that VR, by immersing students in realistic scenarios, fosters an emotional experience that enhances their ability to engage empathetically. The significant gains in empathy, especially in scenarios addressing racial and global issues, are indicative of VR’s potential to foster empathy in ways that traditional educational methods struggle to achieve (T. P.-Y. Nguyen dkk., 2026). It is clear that immersive, experiential learning opportunities like VR simulations can effectively cultivate a more empathetic and culturally aware student body, reinforcing the idea that education must go beyond knowledge transmission and focus on emotional engagement for meaningful learning.

The implications of these findings are profound for higher education institutions. As the world becomes increasingly interconnected, fostering cross-cultural competence in students is essential (Ye dkk., 2025). These results suggest that integrating VR simulations into higher education curricula can provide students with the skills and empathy required to navigate a multicultural world. Institutions should consider incorporating VR-based learning into programs that focus on global citizenship, social justice, and intercultural communication. Furthermore, the findings indicate that VR simulations can complement existing educational strategies by offering students an interactive and immersive learning experience that traditional classroom methods may lack (Sendra-Portero dkk., 2024). For educators, this means embracing innovative teaching tools that can provide students with the practical and emotional understanding necessary to thrive in diverse cultural contexts.

The outcomes of this research can be attributed to the immersive nature of VR, which allows students to step into the shoes of others and experience cultural situations from different perspectives. Unlike reading about a culture or watching a video, VR offers students a chance to engage with virtual environments that feel real, enhancing their emotional connection to the content. The high levels of engagement and emotional immersion achieved through VR simulations

likely explain the significant improvements in both cultural competence and empathy (Chávez-Ventura dkk., 2025). Furthermore, the focus on active participation rather than passive observation, as seen in traditional cultural awareness training, may have contributed to deeper learning outcomes. These findings support the growing recognition that experiential learning, particularly when it involves emotional engagement, can lead to more lasting and meaningful changes in students' attitudes and behaviors toward cultural diversity.

Looking ahead, several steps should be taken to further explore the potential of VR simulations in cross-cultural education (Huang dkk., 2025). Future studies should investigate the long-term effects of VR-based learning on students' ability to apply cross-cultural competence in real-world situations, particularly in professional and social contexts. Research could also expand to include other cultural contexts, examining how VR simulations can address issues such as intercultural communication in workplace settings or global leadership (J.-H. Li dkk., 2025). Additionally, it would be beneficial to explore how different VR platforms and design features influence the learning outcome (Assudani dkk., 2025). Further studies should also explore how VR can be integrated into existing curricula and how students from different educational backgrounds respond to such technology-driven approaches. Finally, policymakers and educational leaders should consider supporting the development and implementation of VR-based learning experiences as a standard tool in cultivating global citizens equipped with the empathy and understanding necessary to navigate an increasingly diverse world.

## CONCLUSION

The key finding of this study is that Virtual Reality (VR) simulations significantly enhance cross-cultural competence and empathy among higher education students. Participants who engaged in VR-based scenarios demonstrated a substantial increase in their understanding of cultural diversity, with notable improvements in their ability to empathize with individuals from different cultural backgrounds. The study revealed that VR, as an immersive tool, offers a more effective approach to cross-cultural education compared to traditional classroom methods. Students in the "Race Relations" and "Global Citizenship" simulations showed the most significant gains, underscoring the potential of VR to foster deep emotional connections and experiential learning about complex cultural dynamics.

This research contributes to the field by demonstrating the practical application of VR in developing cross-cultural competence. Unlike previous studies that focused on VR's role in other educational contexts such as medical or language education, this study specifically explores VR's potential to cultivate empathy and cultural understanding. The value of this research lies in its novel approach to integrating VR into cross-cultural competence training, offering evidence that immersive experiences can engage students emotionally and cognitively in ways that traditional methods cannot. The study's mixed-methods design, combining quantitative assessments with qualitative reflections, provides a comprehensive understanding of the impact of VR simulations on students' cross-cultural learning experiences.

The limitations of this study include its focus on a single higher education institution and a relatively small sample size. The generalizability of the findings may therefore be limited, and the study only examines the immediate effects of VR simulations on students' empathy and cultural competence. Future research should aim to include a larger, more diverse sample of students across multiple institutions to better understand the broader applicability of VR in cross-cultural education. Additionally, long-term studies are needed to evaluate how VR-based learning influences students' behavior and attitudes beyond the classroom, particularly in real-world intercultural interactions.

Further exploration of different VR simulation designs and their impact on various cultural contexts would also contribute to refining VR-based pedagogy.

### AUTHORS' CONTRIBUTION

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.

Author 2: Conceptualization; Data curation; In-vestigation.

Author 3: Data curation; Investigation.

### REFERENCES

- Assudani, P. J., Bhurgy, A. S., Kollem, S., Bhurgy, B. S., Ahmad, Md. O., Kulkarni, M. B., & Bhaiyya, M. (2025). Artificial intelligence and machine learning in infectious disease diagnostics: A comprehensive review of applications, challenges, and future directions. *Microchemical Journal*, *218*, 115802. <https://doi.org/10.1016/j.microc.2025.115802>
- Badawy, W., & Shaban, M. (2025). Educational interventions to enhance empathy in undergraduate nursing students: An integrative review. *Teaching and Learning in Nursing*. <https://doi.org/10.1016/j.teln.2025.08.003>
- Bilderback, S., & Thompson, C. B. (2025). Developing global leadership competence: Redefining higher education for interconnected economies. *Higher Education, Skills and Work-based Learning*, *15*(4), 724–739. <https://doi.org/10.1108/HESWBL-10-2024-0301>
- Chávez-Ventura, G., Polo-López, T., Zegarra-Pereda, L., Balarezo-Aliaga, O., Calderón-Valderrama, C., & Dominguez-Lara, S. (2025). Self-efficacy scale for university teaching in virtual environments, SSUTVE. *Heliyon*, *11*(1), e41134. <https://doi.org/10.1016/j.heliyon.2024.e41134>
- Chen, P., Liang, R., Bao, Z., & Zeng, M. (2026). A systematic review of constructivist group activities for promoting social-emotional learning in primary schools. *Social Sciences & Humanities Open*, *13*, 102323. <https://doi.org/10.1016/j.ssaho.2025.102323>
- Chen, P.-J., & Liou, W.-K. (2025). ChatGPT-driven interactive virtual reality communication simulation in obstetric nursing: A mixed-methods study. *Nurse Education in Practice*, *85*, 104383. <https://doi.org/10.1016/j.nepr.2025.104383>
- Chooniedass, R., Reekie, M., Denison, J., Mercuri, A., Nawara, R., Purcell, N., Oelke, M., & Janke, R. (2025). Embedding cultural safety in nursing education: A scoping review of strategies and approaches. *Journal of Professional Nursing*, *56*, 113–129. <https://doi.org/10.1016/j.profnurs.2024.11.005>
- Dang, T.-Q., Nguyen, T.-M., Tran, P.-T., Phan, T.-T. C., Huynh, T.-B., & Nguyen, L.-T. (2025). From reality to virtuality: Unveiling Gen Z's purchasing behavior through virtual influencers in the metaverse. *Digital Business*, *5*(2), 100141. <https://doi.org/10.1016/j.digbus.2025.100141>
- Elhambakhsh, S. E., Neysani, M., & Nikbakht, A. (2024). Exploring L2 educators' training and professional development needs in VR English language learning. *Heliyon*, *10*(17), e36700. <https://doi.org/10.1016/j.heliyon.2024.e36700>

- Emma, O. (2026). Extended reality in the digital age: A literature review on technology-driven learning environments. *Computers & Education: X Reality*, 8, 100127. <https://doi.org/10.1016/j.cexr.2025.100127>
- Gharib, A. M., Bindoff, I. K., Peterson, G. M., & Salahudeen, M. S. (2025). Educators' and Academic Leaders' Insights on Incorporating Computer-Based Simulation in Pharmacy Education: A Global Qualitative Study. *American Journal of Pharmaceutical Education*, 89(8), 101433. <https://doi.org/10.1016/j.ajpe.2025.101433>
- Guerra-Macías, Y., & Tobón, S. (2025). Development of transversal skills in higher education programs in conjunction with online learning: Relationship between learning strategies, project-based pedagogical practices, e-learning platforms, and academic performance. *Heliyon*, 11(2), e41099. <https://doi.org/10.1016/j.heliyon.2024.e41099>
- Guzmán, D. H., Muñoz, P. C., & Duarte, N. R. (2024). Augmented Reality for Civic Education within Makerspace Museums. *14th International Conference on Emerging Ubiquitous Systems and Pervasive Networks / 13th International Conference on Current and Future Trends of Information and Communication Technologies in Healthcare (EUSPN/ICTH 2023)*, 231, 184–189. <https://doi.org/10.1016/j.procs.2023.12.191>
- Hamash, M., Tiernan, P., & Young, G. (2025). Virtual reality in post-primary education research trends from 2013 to 2024: A systematic-narrative review. *Computers & Education: X Reality*, 7, 100123. <https://doi.org/10.1016/j.cexr.2025.100123>
- Hong, S., Eom, T., & Moon, J. (2025). Virtual reality simulation to foster authentic learning in pre-service teacher education: A systematic literature review. *Educational Research Review*, 49, 100743. <https://doi.org/10.1016/j.edurev.2025.100743>
- Huang, J., Lian, X., Wang, H., Zhu, T., Li, H., Zhao, Y., Wang, R., Wang, D., Yan, W., Hu, S., Guan, X., & Wang, S. (2025). An overview of extreme weather-epidemic compound disasters. *Science Bulletin*, 70(17), 2868–2885. <https://doi.org/10.1016/j.scib.2025.07.001>
- Jans, C., Lucas, C., & Levett-Jones, T. (2025). Utilization, application and effectiveness of metaverse in simulation-based nursing education: A systematic review. *Clinical Simulation in Nursing*, 108, 101807. <https://doi.org/10.1016/j.ecns.2025.101807>
- Koivisto, J.-M., Kämäräinen, S., Mattsson, K., Jumisko-Pyykkö, S., Ikonen, R., & Haavisto, E. (2025). Exploring Nursing Students' Experiences of Empathy and User Experiences in an Immersive Virtual Reality Simulation Game: Cross-Sectional Study. *JMIR Serious Games*, 13. <https://doi.org/10.2196/62688>
- Li, B., Zhou, L., & Hoshino, J. (2025). Collaborative VR environment for supporting food culture learning. *Entertainment Computing*, 55, 100979. <https://doi.org/10.1016/j.entcom.2025.100979>
- Li, J.-H., Tseng, Y.-J., Chen, S.-H., & Chen, K.-F. (2025). Artificial Intelligence in Infection Surveillance: Data Integration, Applications and Future Directions. *Biomedical Journal*, 100929. <https://doi.org/10.1016/j.bj.2025.100929>

- Nguyen, T. A., Nguyen, T. B., Nguyen, D. C., Vu, A. D., Dang, K. L., Le, N. Q., Ngo, D. A., Nguyen, D. K., Hoang, V. T., & Ngo, T. B. (2025). What Are the Opportunities and Challenges of Using AI in Medical Education in Vietnam? *JMIR Medical Education*, *11*. <https://doi.org/10.2196/77817>
- Nguyen, T. P.-Y., Nguyen, T. H.-T., & Nguyen, H. S. (2026). Transforming senior tourism through the metaverse: A systematic review and strategic Implications for healthy ageing. *Strategic Business Research*, *2*(1), 100060. <https://doi.org/10.1016/j.sbr.2026.100060>
- Ronchi, S., Caruso, R., Fabrizi, D., Luciani, M., Alfes, C. M., Colley, N., Magon, A., Conte, G., Valli, A., Terzoni, S., Cilluffo, S., Lusignani, M., & Ausili, D. (2026). Virtual reality in undergraduate and postgraduate nursing education: A scoping review integrating data mining for topic discovery. *Teaching and Learning in Nursing*. <https://doi.org/10.1016/j.teln.2025.12.007>
- Sak, M., & Bilki, Z. (2025). Virtual exchange as an aid for pre-service language teacher wellbeing: Evidence from a Turkish-Polish project. *System*, *134*, 103802. <https://doi.org/10.1016/j.system.2025.103802>
- Sendra-Portero, F., Lorenzo-Álvarez, R., Rudolphi-Solero, T., & Ruiz-Gómez, M. J. (2024). The Second Life Metaverse and Its Usefulness in Medical Education After a Quarter of a Century. *Journal of Medical Internet Research*, *26*. <https://doi.org/10.2196/59005>
- Sengul, T., & Sarıköse, S. (2025). Enhancing learning outcomes through AI-driven simulation in nursing education: A systematic review. *Clinical Simulation in Nursing*, *106*, 101797. <https://doi.org/10.1016/j.ecns.2025.101797>
- Srikasem, S., Seephom, S., Viriyopase, A., Phutrakool, P., Khowintheseth, S., & Narajeenron, K. (2025). Comparing the Effectiveness of Multimodal Learning Using Computer-Based and Immersive Virtual Reality Simulation-Based Interprofessional Education With Co-Debriefing, Medical Movies, and Massive Online Open Courses for Mitigating Stress and Long-Term Burnout in Medical Training: Quasi-Experimental Study. *JMIR Medical Education*, *11*. <https://doi.org/10.2196/70726>
- Sun, X., & Ch'ng, E. (2024). Exploring Miao culture: The differential effect of traditional 2D and immersive 360° documentary formats on viewer learning. *Social Sciences & Humanities Open*, *10*, 101061. <https://doi.org/10.1016/j.ssaho.2024.101061>
- Van Poucke, M. (2024). ChatGPT, the perfect virtual teaching assistant? Ideological bias in learner-chatbot interactions. *Computers and Composition*, *73*, 102871. <https://doi.org/10.1016/j.compcom.2024.102871>
- Visbal-Dionaldo, L., Amidon, B., & Fisher-Cunningham, K. (2025). Enhancing nursing students' caring behaviors for patients with visual alterations through simulation-based education: A scoping review. *Clinical Simulation in Nursing*, *109*, 101861. <https://doi.org/10.1016/j.ecns.2025.101861>
- Xu, L., Hinds, A., Rakisheva, A., El Souefi, N., & Witt, A. (2025). Beyond borders: Virtual Global Engagement in teacher education. *Teaching and Teacher Education*, *165*, 105133. <https://doi.org/10.1016/j.tate.2025.105133>
- Ye, X., Yang, J., & Huang, X. (2025). Transforming communication skills in music education: A cross-cultural study of virtual reality training in the 21st century. *Acta Psychologica*, *261*, 105800. <https://doi.org/10.1016/j.actpsy.2025.105800>

Zhang, Y. S. D., & Noels, K. A. (2024). Understanding the interrelations between cultural empathy, intercultural communication competence, and the psychosocial adjustment of international students in Canada: A longitudinal examination. *International Journal of Intercultural Relations*, 102, 102023. <https://doi.org/10.1016/j.ijintrel.2024.102023>

Zunic, M., Dlab, M. H., Hoic-Bozic, N., & Pribičević, Z. (2025). Educational Potential of the Metaverse: *International Journal of Distance Education Technologies*, 23(1). <https://doi.org/10.4018/IJDET.382480>

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