

ROLE OF AGUMENTED REALITY (AR) AND VIRTUAL REALITY (VR) IN TEACHER EDUCATION

Sunil Kumar

Assistant Professor in Education, Raj Rajeshwari College of Education, Vill. Chorab (Mansui), PO Bhota, Distt. Hamirpur 176041 (H.P.) – INDIA

Email Id: masthimachali220@gmail.com & (M): 88948-90536

ABSTRACT

Augmented Reality (AR) and Virtual Reality (VR) are revolutionary tools in current education, predominantly in teacher training and professional development. These technologies offer immersive, interactive experiences that improve pedagogical practices, classroom management skills, and subject-specific knowledge. This paper examines the roles of AR and VR in teacher education, detailing how they support experiential learning and prepare teachers for 21st-century classrooms. Furthermore, the study investigates significant challenges in implementing these technologies, such as high costs, limited infrastructure, lack of training, and resistance to change. Through a critical review of current literature and case studies, this paper provides actionable insights and recommendations to effectively integrate AR and VR into teacher education curricula.

KEY WORDS: Augmented Reality, Virtual Reality, Teacher Education, Implementation Challenges, Immersive Learning, Educational Technology.

INTRODUCTION

The incorporation of technology in education has transformed teaching methods and learning settings. Augmented Reality (AR) and Virtual Reality (VR) are amongst the most innovative and promising tools existing in present time. They are increasingly recognized in teacher training for their capacity to simulate realistic classroom experiences, enhance immersive learning, and cultivate practical teaching abilities. As teacher preparation programmes aim to develop tech-savvy, reflective, and proficient educators, AR and VR present innovative avenues for rethinking traditional teacher education models. Nonetheless, deploying these technologies can pose challenges, especially in areas with limited resources or inadequate infrastructure. This paper seeks to investigate the dual functions and obstacles linked to the utilization of AR and VR in teacher education.

UNDERSTANDING AUGMENTED REALITY (AR)

Augmented Reality is a digital technology that superimposes computer-generated content onto the real world, enhancing the user's physical environment. Using devices such as smartphones, tablets, and AR glasses, AR blends virtual elements - like 3D models, videos, or animations - with the real-world context.

In education, AR applications enable learners to engage with content in a multi-sensory manner. For instance, a trainee teacher can visualize a virtual solar system in their physical classroom or use an AR-enabled book to access layered content that deepens understanding. AR makes abstract concepts more tangible and supports differentiated instruction by addressing diverse learner needs.

UNDERSTANDING VIRTUAL REALITY (VR)

Virtual Reality submerges users in a fully computer-generated atmosphere, exchanging the real world with a virtual one. VR is typically experienced using headsets such as Oculus Rift, HTC Vive, or Google Cardboard, accompanied by motion-tracking tools and hand controllers. In teacher education, VR can replicate authentic teaching scenarios, such as managing a disruptive classroom or conducting a parent-teacher conference. These simulated experiences allow prospective and in-service teachers to practice instructional and interpersonal skills in a controlled, low-risk setting. VR fosters empathy, situational awareness, and critical thinking skills crucial for educators.

TEACHER EDUCATION: THE NEED FOR REVOLUTION

Teacher education is the foundation for effective educational systems. It comprises both pre-service and in-service training aimed at developing content mastery, pedagogical strategies, classroom organization, and reflective training. As education systems evolve to integrate digital tools, it becomes vital for teachers to be trained not only in content delivery but also in integrating technology into their pedagogy.

Old teacher training methods, such as role-playing and peer teaching, are being complemented and in some cases substituted by digital replications. AR and VR serve as ideal platforms for offering such immersive training experiences. Their integration ensures teachers are better prepared for contemporary classrooms that demand flexibility, inclusivity, and technology proficiency.

ROLE OF AUGMENTED REALITY IN TEACHER EDUCATION

- 1. Content Conception:** AR enables teacher trainees to present abstract and complex concepts in interactive formats, increasing student engagement and comprehension.

2. **Interactive Micro-teaching:** AR platforms simulate student interactions and provide feedback to help trainees improve lesson delivery and classroom strategies.
3. **Assessment Practice:** With AR, teacher candidates can participate in dynamic assessments that adapt based on their responses and teaching style.
4. **Inclusive Pedagogy:** AR supports simulation of diverse student needs, including special education scenarios, enhancing trainee awareness and adaptive strategies.
5. **Real-Time Feedback:** AR applications can record and analyse teaching behaviours, offering detailed feedback to improve classroom performance.

ROLE OF VIRTUAL REALITY IN TEACHER EDUCATION

1. **Simulated Classroom Environments:** VR creates risk-free environments where teachers can experiment with classroom strategies and manage diverse learner behaviours.
2. **Behaviour Management Training:** Realistic scenarios help pre-service teachers practice conflict resolution and communication skills.
3. **Reflective Practice:** Sessions can be recorded and revisited for self-analysis and improvement.
4. **Cultural Immersion:** VR can expose trainees to multicultural classrooms, promoting global competencies and empathy.
5. **Distance Training:** VR can connect trainees and mentors from different geographic locations for collaborative professional development. Case studies have shown that VR improves knowledge retention, builds teaching confidence, and promotes deep learning among trainee teachers.

MAJOR CHALLENGES IN EMPLOYING AR AND VR IN TEACHER EDUCATION

Regardless of the clear advantages, several challenges hinder the unified integration of AR and VR in teacher education:

1. **High Costs and Limited Funding:** AR/VR hardware, such as headsets and sensors, is often expensive. Many institutions, especially in developing countries, cannot afford these technologies.
2. **Infrastructure and Technical Limitations:** Reliable internet connectivity, device compatibility, and adequate IT support are critical, yet often lacking in rural or under-resourced areas.

3. **Lack of Digital Literacy:** Both trainers and trainees may lack the necessary digital skills to use AR/VR tools effectively.
4. **Inadequate Content Availability:** There is a lack of good, curriculum-aligned AR and VR educational content personalized for teacher training.
5. **Resistance to Technological Change:** Educators and administrators accustomed to traditional teaching methods may be reluctant to adopt unfamiliar technologies.
6. **Privacy and Data Security:** The use of AR and VR raises concerns regarding the privacy and security of user data, particularly in online or cloud-based platforms.
7. **Maintenance and Technical Support:** Continuous maintenance, updates, and troubleshooting require dedicated staff and resources, which are often unavailable.

Addressing these challenges involves policy reform, strategic investment, faculty training, and collaboration between educational institutions and technology developers.

CONCLUSION

Augmented Reality and Virtual Reality offer unparalleled opportunities to innovate teacher education by making it more engaging, experiential, and effective. They empower teacher trainees to practice, reflect, and refine their skills in dynamic, simulated environments. However, the successful implementation of AR and VR requires overcoming significant barriers related to cost, infrastructure, content, and training. Institutions must develop strategic plans to integrate these technologies into teacher education curricula, supported by adequate funding, professional development, and policy support. With thoughtful adoption and collaboration, AR and VR can transform teacher preparation and contribute to more adaptable, tech-savvy educators ready for the classrooms of the future.

REFERENCES

- Abdullah, M. A., Jaboob, M., Garad, A., & Al-Ansi, A. (2023). Analyzing augmented reality (AR) and virtual reality (VR) recent development in education. *Social Sciences & Humanities Open*, 8(1), 100532. <https://doi.org/10.1016/j.ssaho.2023.100532>
- Dalgarno, B., & Lee, M. J. W. (2010). What are the learning affordances of 3-D virtual environments? *British Journal of Educational Technology*, 41(1), 10–32. <https://doi.org/10.1111/j.1467-8535.2009.01038.x>
- Dede, C. (2009). Immersive interfaces for engagement and learning. *Science*, 323(5910), 66–69. <https://doi.org/10.1126/science.1167311>

- Iberdrola. (n.d.). *Virtual reality*. <https://www.iberdrola.com/innovation/virtual-reality>
- Khan, M. S., Umer, H., & Faruque, F. (2024). Artificial intelligence for low income countries. *Humanities and Social Sciences Communications*, 11, 1422. <https://doi.org/10.1057/s41599-024-03947-w>
- Lee, K. (2012). Augmented reality in education and training. *Tech Trends*, 56(2), 13–21. <https://doi.org/10.1007/s11528-012-0559-3>
- LinkedIn. (n.d.). *What are the current challenges and limitations of VR technology?* <https://www.linkedin.com/advice/3/what-current-challenges-limitations-vr-technology>
- Radianti, J., Majchrzak, T. A., Fromm, J., & Wohlgenannt, I. (2020). A systematic review of immersive virtual reality applications for higher education: Design elements, lessons learned, and research agenda. *Computers & Education*, 147, 103778. <https://doi.org/10.1016/j.compedu.2019.103778>
- Selvan, Dr. (2025). Virtual reality and augmented reality in teacher training: A transformative approach to professional development. *International Journal of Emerging Knowledge Studies*, 4, 56–60. <https://doi.org/10.70333/ijeks-04-02-s-012>
- Slater, M., & Sanchez-Vives, M. V. (2016). Enhancing our lives with immersive virtual reality. *Frontiers in Robotics and AI*, 3, 74. <https://doi.org/10.3389/frobt.2016.00074>
- Wojciechowski, R., & Cellary, W. (2013). Evaluation of learners' attitude toward learning in AR-based educational environments. *Computers & Education*, 68, 570–585. <https://doi.org/10.1016/j.compedu.2013.02.014>
- Yuen, S. C. Y., Yaoyuneyong, G., & Johnson, E. (2011). Augmented reality: An overview and five directions for AR in education. *Journal of Educational Technology Development and Exchange*, 4(1), 119–140. <https://doi.org/10.18785/jetde.0401.10>

Submitted On: May 10th, 2025

Accepted On: July 10th, 2025