

**“AUGMENTED AND VIRTUAL REALITY IN PROMOTING SDG EDUCATION:
INDIAN CASE STUDIES”**

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ABSTRACT

Virtual reality (VR) and augmented reality (AR) are becoming more widely acknowledged as revolutionary tools in public awareness campaigns and education. These immersive technologies facilitate experiential learning, the visualisation of intricate global issues, and increased learner involvement in relation to the Sustainable Development Goals (SDGs) of the United Nations. With an emphasis on India, this chapter explores how AR and VR might support SDG education. It incorporates in-text APA citations, examines educational advantages, difficulties, and opportunities, and provides SDG-wise Indian case studies. The chapter emphasises how immersive technologies complement India's National Education Policy (NEP) 2020 and Education for Sustainable Development (ESD).

Keywords: Augmented Reality, Virtual Reality, Sustainable Development Goals, Experiential Learning, Digital Education, India.

1. INTRODUCTION

The Sustainable Development Goals (SDGs), which were adopted by the UN in 2015, offer a global framework for tackling economic, social, and environmental issues (United Nations, 2015). To accomplish these goals, widespread knowledge, excellent education, and involved citizens are required. Education for Sustainable Development (ESD) empowers students to understand sustainability issues and contribute to solutions through informed decision-making (UNESCO, 2017). India's National Education Policy (NEP) 2020 strongly emphasises digital integration, experiential learning, and multidisciplinary education to improve learning

outcomes (Government of India, 2020). In this sense, immersive technologies such as Virtual Reality (VR) and Augmented Reality (AR) offer innovative approaches to teaching SDGs by enabling students to visualise issues in the real world and experience sustainability concerns in simulated environments.

2. CONCEPTUAL FRAMEWORK OF AR AND VR IN EDUCATION

Augmented reality (AR) enables interactive and contextual learning experiences by superimposing digital data on the real world (Azuma, 1997). On the other hand, by providing a fully immersive digital environment where users can interact with realistic scenarios, virtual reality (VR) promotes experience and empathy-based learning (Radianti et al., 2020). Both AR and VR support constructivist learning theories, which emphasise active engagement and knowledge creation through experience (Dede, 2014). These pedagogical approaches are particularly relevant to SDG education since students need to understand interconnected social, economic, and environmental systems.

3. SDG - INDIAN CASE STUDIES USING AR AND VR

3.1 SDG 4: QUALITY EDUCATION

In India, the use of AR and VR to enhance educational quality and inclusivity is growing. Government platforms like PM eVidya and DIKSHA support digital learning initiatives that can use AR-enabled content for interactive textbooks and virtual laboratories. Several Indian ed-tech companies have developed AR-based science and geography courses that allow students to visually examine concepts related to ecosystems, energy systems, and sustainability in order to enhance conceptual understanding and retention (Government of India, 2020). In Indian engineering and science colleges, virtual reality laboratories allow students to conduct experiments in a simulated environment, reducing the need for physical equipment and promoting equitable access to education (Radianti et al., 2020).

3.2 SDG 13- CLIMATE ACTION

In the vital subject of climate change education, virtual reality has proven to have a big impact. Virtual reality (VR) simulations are used by non-governmental organisations and educational institutions in India to show the effects of climate change, such as heat waves, flooding, coastline erosion, and water scarcity. Students can virtually experience the effects of rising sea levels in coastal regions like Tamil Nadu and Kerala, encouraging pro-environmental sentiments and climate awareness (UNESCO, 2017). Such immersive climate education

programs must encourage sustainable behaviour and raise emotional engagement in order to meet SDG 13 (Makransky et al., 2019).

3.3 SDG 11- SUSTAINABLE CITIES AND COMMUNITIES

India's Smart Cities Mission uses digital visualisation techniques like AR and VR for community involvement, urban planning, and infrastructure design. Augmented reality software allows students and urban planners to view sustainable transportation systems, green buildings, and waste management practices. Academic institutions use VR-based city simulations to teach sustainable urban development and community resilience (World Economic Forum, 2023). These initiatives help students understand the complexity of urban sustainability while promoting SDG 11-aligned participatory planning.

3.4 SDG 3 – GOOD HEALTH AND WELL BEING

VR-based simulations are widely used in Indian medical and nursing education to teach students about clinical procedures, emergency response, and disaster management. Virtual training modules improve public health knowledge and preparedness by modelling pandemic response scenarios (Radianti et al., 2020). These applications help achieve SDG 3 by increasing health education, promoting skill development, and increasing public health awareness.

4. PEDAGOGICAL BENEFITS OF AR AND VR FOR SDG AWARENESS

There are various pedagogical benefits to incorporating AR and VR into SDG teaching. According to Makransky et al. (2019), immersive learning environments facilitate long-term information retention, improve student engagement, and encourage experiential learning. While AR promotes contextual learning by visualising sustainability topics in real time, VR experiences help students develop empathy by letting them experience sustainability issues from the viewpoint of impacted communities (Azuma, 1997). By promoting critical thinking, teamwork, and problem-solving, these advantages promote the objectives of NEP 2020 and are consistent with outcome-based education (Government of India, 2020).

5. CHALLENGES AND LIMITATIONS IN INDIAN CONTEXT

Despite their potential, India's adoption of AR and VR is being impeded by factors like high implementation costs, inadequate digital infrastructure in rural regions, a shortage of qualified educators, and the digital divide. To guarantee appropriate deployment, accessibility, inclusivity, and ethical issues pertaining to data privacy and screen exposure must be addressed (World Economic Forum, 2023).

6. FUTURE DIRECTIONS AND CONCLUSION

The popularity of AR and VR in Indian education is anticipated to accelerate due to advancements in 5G connectivity, inexpensive mobile devices, and artificial intelligence. Immersion SDG education projects can be further improved by cooperation between educational institutions, governmental organisations, technological companies, and non-governmental organisations. In conclusion, AR and VR are effective means of promoting Sustainable Development Goals education and awareness in India. These technologies enable learners to make significant contributions to sustainable development by bridging the gap between knowledge and action through SDG-wise applications and immersive learning experiences.

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