Immersive Learning Environment: A Revolutionary Shift in the Indian Teaching Learning System

Sasmita Maharana[1], Dr. Praveen Bobby Binjha[2]

[1]Ph.D. Scholar, Department of Education, Ravenshaw University, Cuttack, Odisha.
[2]Faculty, CIET, NCERT, New Delhi

Abstract

The rapidly growing coaching culture of India points at the inefficiency of formal classroom practices that is needful for the present era. The over reliance on rote learning, memory-based exam system, score-based competitions hinder the growth of India to stand in the global market. All these arise from ineffective pedagogical practices, inefficient teachers, insufficient resources, disengagement of learners etc. And leads to severe academic stress on learners, hindering the real learning process. In order to address these crises, the present paper explores the potential benefits of ILE-Immersive learning environment which is a technology enabled transformation of Indian classrooms. This provides a learner centred holistic and equitable conducive learning system that makes learning more active, enjoyable, realistic, interactive and experiential. The personalized learning experiences become more intense with very effective learning outcomes through the immersive technological components like VR (virtual reality) AR (augmented reality), mixed reality (MR), XR (Extended reality) and 360-degree simulation. This helps in achieving the goals of Nation Education Policy (NEP 2020), making an 21st century competency-based India. Certain limitations like high cost, lack of resources, awareness and training, cultural-lingual barriers can be addressed through a pragmatic approach where the stakeholders act in partnership. ILEs promise not only improving the learning outcomes, rather nurturing the 21st century skills like, critical thinking, real world problem solving, digital literacy, creativity and teamwork. The successful integration needs public private partnership, quality teacher training, localization of content and flexible mindset for adoption.

Keywords: Immersive learning, pedagogy, Instructional design, Active learning, Indian educational system

INTRODUCTION

Education is a way of holistic development of an individual where the stakeholders aim at developing all the aspects, like: individual, societal, intellectual, and environmental. It is the acquisition of knowledge, values, attitudes, and skills that enable an individual to lead a successful and effective life in society (Miseliunaite, Kliziene, & Cibulskas, 2022). The Universal Declaration of Human Rights (1948) states that education is a fundamental human right (United Nations, n.d.). Even the SDG-4 of the 2030 Agenda emphasizes the importance of the right to education in order to attain the goals of sustainable development (UNESCO, n.d). Though various modes like: formal, informal and nonformal leads to the attainment of education, the formal mode is mostly preferable all over the world (La Belle, 1982; Donitsa-Schmidt &

Zuzovsky, 2018). In India this is emphasized in the RTE-2009 act, to make schooling compulsory for the age group of children 6-14years (Jha, 2018; Paul, 2024). On average, the formal schooling system lasts from 6-7 hours/day. Which means a student spends the quality time of a day in school(NCERT, 2000; British Council, 2005). But the rapid growth of the coaching industry in India has put the biggest question mark on quality education being provided in Indian schools. Going beyond the CBSE, ICSE or any state boards coaching centres have their own syllabi and goals. The attractive advertisements of making any student successful in any entrance or govt.jobs make parents send their children to coaching even after a long hour of schooling (Baruah & Wankhar, 2024; Kumar, 2023). Thus, the coaching culture has superseded the formal schooling system, making mark scoring superior to real learning. In some cases, this competitive race of scoring marks over genuine learning has pushed many students towards suicide by putting excess academic pressure, ignoring the individual abilities and limitations (Balamurugan, Sevak, Gurung, & Vijayarani, 2024; Shekhawat, Meena, Yadav, Dhaka, & Vignesh, 2023; Deb & Deb, 2025). According to one recent report published in The Times Of India dated 6th May,2025, two students died by suicide and one was hospitalized after attempting to take his own life following the announcement of the class 12 exam result by Madhya Pradesh Board Of Secondary Education(MPBSE). This highlights the immense academic pressure on learners(PTI,2025).

What is the need of coaching centres for a student when he/she spends almost 7 long hours in a formal classroom with qualified teachers? It implies the lack of quality educational practices that creates the inferiority among both parents and their wards about the success in any examinations/jobs. Directly/indirectly this fear of both parents and student community has fostered the growth and development of the coaching industry in India (Gupta, 2024; Times of India, 2023). Among several factors that lead to the expansion of coaching culture like: instructional gap of classrooms, memory-based examination system, highly competitive job market, etc. Among all of these, the significance of the classroom teaching learning process in a competitive world makes parents and students opt for additional coaching facilities (Gupta,2024; Verma, Sachdeva, & Bajpai, 2023). The inefficiency of classroom teaching learning system arises from lack of verity teaching methods adopted by teachers, limited instructional materials that is centred around mostly textbook and syllabus, unavailability of conducive learning environment, lack of teachers appropriate student friendly morale, lack of proper resources, lack of efficient teachers and teaching mediums, lack of proper teacher training programmes, mismatch between the teachers' teaching approach and learners expectations and learning approach, lack of proper feedback and identification of learning barriers and so on(Schneider, Wessels, & Pilz, 2023; Mupa & Chinooneka, 2015; Kapur, 2022; Kholisah, Saskia, Dinarti, Rohmatilahi, and Rostika 2024). All of these problems can be optimized through the help of science and technology. The 21st century has come up with many wonders of science and technology, among which one is Immersive technology. Through this technology, learners can be immersed in the field of learning that makes the abstract world feel real and enjoyable. Thus, making the whole teaching learning process becomes fun rather than putting cognitive load and pressure on both the student as well as teacher community (Alazmi & Alemtairy, 2024; Poupard, Larrue, Sauzéon, & Tricot, 2024; Agbo, Olaleye, Bower, & Oyelere, 2023). This paper highlights the potential of technology that can optimize the teaching learning system of India through an immersive learning environment through highly interactive, engaging, and personalizing experiences, which also aligns with the National Education Policy 2020 goals of making the Indian education system more holistic, flexible, multidisciplinary, skill oriented and technology integrated without leaving the rich culture.

Understanding Immersive learning environment

ILE is an engaging and interactive learning environment that is created with help of a set of technological/non technological means (Brunetti, Ferrante, Avella, Indraccolo, & Del Gatto, 2024; Kuznetcova, Tilak, Wen, Glassman, Anderman, & Lin, 2023; Koç & Kanadlı, 2025). The term immersion refers to a state of humans where the sense of self-consciousness and time awareness fades away. Thus, the individual gets engrossed in the environment, having a feeling of presence, attention, and immersion. This feeling of being a part of the environment rather than feeling like an outside observer makes the experience more concrete and focused (Baños, Botella, Alcañiz, Liaño, Guerrero, & Rey, 2004). The concept of an immersive environment is not new. Before the technological era, it was created only through psychological means. For example-role playing, simulations, drama, storytelling, theatre. All these were centred around the imagination, physical, emotional, social and experiential engagement of individuals (Zhang, Xu, & Li, 2025; Brown & Chidume, 2023). With the advancement of technology, the creation of an immersive environment has become easier, making learning more interactive, through which the complex and abstract concepts turn simpler and concrete. The foundation of an immersive learning environment lies in the psychological base of enhancing the engagement, retention, and motivation that occurs in the individual mind. Thus, technology acts as a tool in creating and navigating immersive environments with the help of various psychological principles (Makransky & Petersen, 2021; Yang, Cai, Diao, Liu, Liu, & Xiang, 2023).

Neither one alone is effective in providing an effective ILE experience. It is the combination of both technology and psychology that makes the learning enjoyable and exciting (Makransky & Petersen, 2021; Yang, Cai, Diao, Liu, Liu, & Xiang, 2023; Ibrahim, Alfalqi, & Al-Badarneh, 2017). The various components of Immersive technology are: VR, AR, MR, XR, and 360-degree Simulations.

VR (Virtual reality): Virtual reality refers to a fully digital environment that takes the learner away from the real world to a virtual world. By wearing a headset, a user can enter this virtual world. Example: a virtual tour in a roller coaster seems to be so real that the user may experience nausea and dizziness like the actual scenario (Di Lieto, Inguaggiato, Castro, Cecchi, Cioni, Dell'Omo, Laschi, Pecini, Santerini, Sgandurra, & Dario, 2017; Mazloumi Gavgani, Walker, Hodgson, & Nalivaiko, 2018).

AR (Augmented Reality): Here, the virtual text, images, or animated versions of virtual world things can be brought to the real world without disconnecting the connection of user from the real world. It can be done through digital devices like glass/mobile phones (Santos, Lübke, Taketomi, Yamamoto, Rodrigo, Sandor, & Kato, 2016; Zulfiqar, Raza, Khan, Arif, Alvi, & Alam, 2023).

MR (Mixed reality): It is the combination of both VR and AR, where the virtual images enter into the real world and allow the user to interact with it in real time. By wearing headsets, it can be felt (Crogman, Cano, Pacheco, Sonawane, & Boroon, 2025; Skarbez, Brooks, Jr., & Whitton, 2017).

XR (Extended reality): Extended reality is the combination of the overlapping features of AR, VR, and MR that allows a user to have multiple immersive experiences at one place and one time (Rauschnabel, Felix, Hinsch, Shahab, & Alt, 2022; Doolani, Wessels, Kanal, Sevastopoulos, Jaiswal, Nambiappan, and Makedon, 2020).

360-degree simulations: This provides a full panoramic view in a spherical way, where the user can observe any phenomenon/object from all positions. It can be done through headsets, 360-degree cameras, smartphone phone devices (Christopoulos, Pellas, Qushem, & Laakso, 2023; Peney & Skarratt, 2024).

Potential benefits of integrating ILE in the classroom T-L process

The classroom teaching learning process becomes effective when both teacher and students become active participants of the whole process, starting from setting the objectives of any lesson up to assessment and feedback. The successful learning outcome is neither dependent on teachers nor students. Rather, it is a collaborative approach where teachers and students are equally responsible for the positive outcome of the process (Nash & Winstone, 2017; Decristan, Jansen, & Fauth, 2023). Failing which, the teaching learning process becomes one-sided, like teacher-centered, and students just act as mere followers. Thus, the T-L process fails in attaining the desired goals. Besides this, some other factors like the inability of teachers to simplify the complex contents and concretize abstract concepts, lack of resources, lack of students' prior knowledge, dislike of any subject or concerned teacher, inappropriate teaching learning approaches, ignorance of learners' abilities and challenges collectively, are responsible for making the T-L process ineffective and unsuccessful (American Association for the Advancement of Science, n.d.; Susuoroka, Jagri, Mohammed, Anass, Abdul-Mumin et. al,2021; Bigozzi, Tarchi, Fiorentini, Falsini, & Stefanelli, 2018; Mudau, 2013). Technology plays a vital role in optimizing many of these factors. And one of the most notable contributions is the ability to create an immersive learning environment. Some major benefits of integrating ILE in the regular classroom teaching-learning process are:

1. Increasing the engagement and motivation of learners through more realistic experiences that remove the barrier of abstraction. Thus, the cognitive load on learners' memory decreases and learning becomes effective (Song, Shin, & Shin, 2023; Alazmi & Alemtairy, 2024; Liu, Wang, Koszalka, & Wan, 2022).

2. Fostering interest and curiosity in learners to explore the world around them without any fear of accidents and allowing them to learn from repeated mistakes (Leong, 2025).

3. Can bridge the gap between theoretical and practical knowledge by providing an opportunity to have simulated real-world experiences (Yang, Zhang, Hu, & Zhao, 2024; Klingenberg, Bosse, Mayer, Makransky, & Petersen, 2024; Krajčovič, Gabajová, Matys, Furmannová, & Dulina, 2022).

4. Can provide the individual learning space for every student to explore their strengths and limitations through repeated exploration (Marougkas, Troussas, Krouska, Alexandropoulos, & Virvou, 2024; Seo, Park, & Koo, 2024).

5. Helps in deeper understanding of concepts and long-term retention of the learned concepts through a multisensory learning experience (Anjos, Martins, Rodrigues, Sellitto, & Silva, 2024; Alwashmi, Meyer, Rowe, & Ward, 2024).

6. Can foster 21st century skills like critical thinking, problem solving, collaborative interaction, and digital competencies (Cabrera-Duffaut, Pinto-Llorente, & Iglesias-Rodríguez, 2024; Liu, Meng, Zheng, Zhang, & Li, 2025; Wang, Quirke, & McGuckin, 2022; Serrano-Ausejo & Mårell-Olsson, 2024).

7. Allows teachers to play the role of a real facilitator where he/she facilitate learning of students at their own pace with proper guidance (Silseth, Steier, & Arnseth, 2024; Stavroulia & Lanitis, 2023).

ILE's intended transformation in the T-L system

The technological power of ILE can significantly transform the existing teaching learning system of India in a way to stand against global demands. Table 1 emphasizes the key transformations ILE aims to bring to the prevailing T-L practices.

Table-1

Key dimensions	Prevailing T-L practices in India	Intended transformations by ILE
Role of the teacher	Teacher-centred (as an active agent and whole responsible holder of the successful teaching and learning process)	Makes teachers play the roles of facilitators
Teaching approach	Based on the lecture method and rote memorization	Based on experiences and understanding
Role of learners	Passive receiver of knowledge	Active participants
Learning methods	Memory-based and textbook-centred	Beyond rote learning and textbook
Level of conceptual understanding	Difficult to visualize the complex and abstract concepts	Deep understanding through clear visualization
Students' engagement	Depends on students' interest and teachers' ability to create interest	Mostly high engagement
Students' motivation	Extrinsic in nature	Intrinsic in nature
Classroom activities	Question, answer, discussion, and solving of textbook-centered problems	Exploration, real-world problem solving
Practical application	Limited and restricted by the availability of resources. Mostly observe the demonstrations.	Unlimited, hands-on with virtual objects in real real-world scenario and timing.
Individual differences	Not much addressed, mostly one size fits all	Caters to individual learning preferences and pace.
Skill development	Limited and theoretical	21st-century oriented and mostly practical
Learning experiences	Mostly cognitive	Multisensory
Learners' autonomy	Restricted and dependent on the teacher's direction	It is high, yet sometimes it needs a teacher's scaffolding

Technology integration	Low or, in some cases, negligible	High enough
Home work	Textbook-centred questions and projects	Real-world problem-based
Assessment	Mark/score based	Skill/application oriented

Table 1: The ILE intended transformation of prevailing T-L practices of India

Link with National Education Policy 2020(NEP 2020)

Looking at the global demands of the 21st century, the NEP 2020 of India states about transforming the current Indian education system by shifting it to a more flexible, learner-centred, holistic, and competency based. The integration of ILE in Indian classrooms aligns with the aims of this policy document to create a technology-driven India by enhancing critical thinking, problem-solving, and digital competencies. This Policy proposes the revision and revamping of all aspects of the education structure, including its regulation and governance, to create a new system that is aligned with the aspirational goals of 21st-century education, including SDG4, while building upon India's traditions and value systems. The National Education Policy lays particular emphasis on the development of the creative potential of each individual. It is based on the principle that education must develop not only cognitive capacities, but also 'foundational capacities 'of literacy and numeracy and 'higher-order' cognitive capacities, such as critical thinking and problem solving, along with social, ethical, and emotional capacities and dispositions (NEP,2020, pp.3-4).

The vision of the policy is stated as, "This National Education Policy envisions an education system rooted in Indian ethos that contributes directly to transforming India, that is Bharat, sustainably into an equitable and vibrant knowledge society, by providing high-quality education to all, and thereby making India a global knowledge superpower. The Policy envisages that the curriculum and pedagogy of our institutions must develop among the students a deep sense of respect towards the Fundamental Duties and Constitutional values, bonding with one's country, and a conscious awareness of one's roles and responsibilities in a changing world. The vision of the Policy is to instill among the learners a deep-rooted pride in being Indian, not only in thought, but also in spirit, intellect, and deeds, as well as to develop knowledge, skills, values, and dispositions that support responsible commitment to human rights, sustainable development and living, and global well-being, thereby reflecting a truly global citizen" (NEP,2020, pp.6). The holistic development of students aimed by NEP 2020 discards the mere acquisition of knowledge, emphasizing a deeper understanding of social contexts and the skills to integrate various outlooks to solve complex societal and environmental problems through multidisciplinary and interdisciplinary education that is centred around the technology-driven, learner-centric teaching and learning process.

The limitations in the integration of ILE

Though the potential of ILE is enormous, its adoption in India has several challenges related to financial cost, availability of resources, technological access and use, awareness of teachers and parents, support of policy and stakeholders, and availability of suitable content. The key limitations are

1. The huge cost of tools and devices to be used in creating ILE is not affordable to a single entity with a low to medium budget (Galhotra, Seth, Lowe, & Sharma, 2024; Kumar & Selva Ganesh, 2022;

Baidya & Gope, 2025).

2. Lack of sufficient resources like electricity, high-speed internet, and inefficiency of teachers are some of the barriers (Kumar & Selva Ganesh, 2022; Serrano-Ausejo & Mårell-Olsson, 2024).

3. Readiness of teachers to adopt technology and undergo the required skills and training. So, lack of teachers' required competencies and a rigid mindset to shift from traditional practices to technology-driven practices often hinder the essential learning outcome (Serrano-Ausejo & Mårell-Olsson, 2024; Silseth, Steier, & Arnseth, 2024; Kumar & Selva Ganesh, 2022).

4. The creation of ILE-supported content needs a team of expert people from various disciplines, like: collaboration of subject experts, instructional and graphic designers, and technologists working collaboratively. So, everyone can not create the content alone (Baidya & Gope, 2025; Serrano-Ausejo & Mårell-Olsson, 2024; Seth, Sharma, Lowe, & Galhotra, 2024).

5. Prolonged use of ILE devices may cause nausea, dizziness, motion sickness, eye strains like health discomforts to users (Conner, Freeman, Jones, Luczak, Carruth, Knight, & Chander, 2022; Fan, Wang, Li, Song, Dong, Bao, & Wang, 2023; Simón-Vicente, Rodríguez-Cano, Delgado-Benito, Ausín-Villaverde, & Cubo Delgado, 2024).

6. Language and cultural barriers, like the lack of availability of content in every single local and tribal language, hamper the wide use of ILE (Panicker, 2020).

7. ILE experiences may not be suitable for visually challenged learners and educators, restricting their active participation and inclusion (Corradini, Clari, & Maresca, 2023).

Suggestions

Though there are some limitations associated with ILE-integrated classrooms, the significant reformations it causes in the field of education are commendable. Thus, it can boost the Indian education system to stand against the demands of the 21st-century world. A few suggestions for effective integration of ILE in regular classroom practices can be as follows.

- Any educational initiative becomes beneficial for society through a public-private partnership, where the financial weight is shared by both parties. Looking at the rapid global development, Government and private bodies must work mutually to boost the Indian education system to stand at a global level (Kumari, 2016; Sajida & Kusumasari, 2023; Sharma, 2025).

- The resource disparities among rural and urban areas must be reduced, and proper allocation of resources like electricity, digital devices, internet access, and low-cost implementation should be done on a priority basis (Kumar & Selva Ganesh, 2022).

- Awareness and proper training for navigation of technological devices in the classroom need quality teacher training and professional development programmes. Thus, quality teacher education must be ensured (Mystakidis, Fragkaki, & Filippousis, 2021; Choudhury, Chechi, Kaur, Dutta, Deb, and Mohanty, 2024).

- Development and inclusion of localized content in the curriculum is another demand of the situation (Panicker, 2020).

- Encouraging Innovation and research in the field of technology-driven education systems, along with sustainable solutions to probable challenges supported by adequate funding facilities, can lower the high investment costs (Baidya & Gope, 2025).

Conclusion

The 21st-century world is moving faster than imagination, and to keep up with it, the urgency of a technology-integrated education system in India cannot be overlooked. At present, the Indian classroom teaching learning process is mostly textbook-centric and exam-oriented. This makes learners choose the path of rote memorization as a means to score high. The competition for scoring high in school, college, universities, or any entrance exams makes parents and students seek outside help beyond formal classroom hours. This fosters the growth of coaching culture in India, along with enhancing the academic pressure on learners. It contradicts the vision of NEP 2020 that urges for a holistic, competency-based, and technology-driven education system, making learning a joyful act. The existing wide gap between the theoretical and practical knowledge system of India can be diminished through effective integration of technology in classroom practices. Thus, making learning a multisensory and realistic experience. Through the integration of immersive technologies, the revolutions of Indian classrooms can create skilled, competent, and future-ready citizens in alignment with the goals of NEP 2020. A pragmatic technological framework rooted in India's rich culture and heritage needs the joint hands of all the stakeholders to create a more powerful India.

Reference

1. Agbo, F. J., Olaleye, S. A., Bower, M., & Oyelere, S. S. (2023). Examining the relationships between students' perceptions of technology, pedagogy, and cognition: The case of immersive virtual reality mini games to foster computational thinking in higher education. *Smart Learning Environments, 10*, 16. https://doi.org/10.1186/s40561-023-00233-1
2. Alazmi, H. S., & Alemtairy, G. M. (2024). The effects of immersive virtual reality field trips upon student academic achievement, cognitive load, and multimodal presence in a social studies educational context. *Education and Information Technologies, 29*, 22189–22211. https://doi.org/10.1007/s10639-024-12682-3
3. Alwashmi, K., Meyer, G., Rowe, F., & Ward, R. (2024). Enhancing learning outcomes through multisensory integration: A fMRI study of audio-visual training in virtual reality. *NeuroImage, 285*, 120483. https://doi.org/10.1016/j.neuroimage.2023.120483
4. American Association for the Advancement of Science. (n.d.). Chapter 13: Effective learning and teaching [Science for all Americans online]. Project 2061. https://www.project2061.org/publications/sfaa/online/Chap13.htm
5. Anjos, F. E. V. d., Martins, A. d. O., Rodrigues, G. S., Sellitto, M. A., & Silva, D. O. d. (2024). Boosting Engineering Education with Virtual Reality: An Experiment to Enhance Student Knowledge Retention. *Applied System Innovation*, *7*(3), 50. https://doi.org/10.3390/asi7030050
6. Baidya, M., & Gope, D. (2025). Shaping the digital campus: The transformative aspects of artificial intelligence, augmented reality, and virtual reality on higher education in India. *International Journal of Creative Research Thoughts, 13*(4). https://doi.org/10.56975/ijcrt.v13i4.284029
7. Balamurugan, G., Sevak, S., Gurung, K., & Vijayarani, M. (2024). Mental health issues among school children and adolescents in India: A systematic review. *Cureus, 16*(5), e61035. https://doi.org/10.7759/cureus.61035
8. Baños, R. M., Botella, C., Alcañiz, M., Liaño, V., Guerrero, B., & Rey, B. (2004). Immersion and emotion: Their impact on the sense of presence. *CyberPsychology & Behavior, 7*(6), 734–741. https://doi.org/10.1089/cpb.2004.7.734

9. Baruah, P., & Wankhar, D. L. (2024). Private coaching rise is now a prestige issue for Indian families. That's a vicious turn. *The Print*. https://www.ncaer.org/publication/private-coaching-rise-is-now-a-prestige-issue-for-indian-families-thats-a-vicious-turn/

10. Bigozzi, L., Tarchi, C., Fiorentini, C., Falsini, P., & Stefanelli, F. (2018). The influence of teaching approach on students' conceptual learning in physics. *Frontiers in Psychology, 9*, Article 2474. https://doi.org/10.3389/fpsyg.2018.02474

11. British Council. (2005). *India education report*. https://studylib.net/doc/18675539/india-education-report

12. Brown, L. G., & Chidume, T. (2023). Don't forget about role play: An enduring active teaching strategy. *Teaching and Learning in Nursing, 18*(1), 238–241. https://doi.org/10.1016/j.teln.2022.09.002

13. Brunetti, R., Ferrante, S., Avella, A. M., Indraccolo, A., & Del Gatto, C. (2024, December 6). Turning stories into learning journeys: The principles and methods of immersive education. *Frontiers in Psychology, 15*, Article 1471459. https://doi.org/10.3389/fpsyg.2024.1471459

14. Cabrera Duffaut, A., Pinto Llorente, A. M., & Iglesias Rodríguez, A. (2024). Immersive learning platforms: Analyzing virtual reality contribution to competence development in higher education—a systematic literature review. *Frontiers in Education, 9*, Article 1391560. https://doi.org/10.3389/feduc.2024.1391560

15. Choudhury, S., Chechi, V. K., Kaur, D., Dutta, I., Deb, J. P., & Mohanty, S. (2024). Educators' perceptions of the use of virtual reality in the classroom: Psychometric validation of scale in Indian context. *International Journal of Experimental Research and Review, 42*, 217–227. https://doi.org/10.52756/ijerr.2024.v42.019

16. Christopoulos, A., Pellas, N., Qushem, U. B., & Laakso, M.-J. (2023). Comparing the effectiveness of video and stereoscopic 360° virtual reality-supported instruction in high school biology courses. *British Journal of Educational Technology, 54*(4), 987–1005. https://doi.org/10.1111/bjet.13306

17. Corradini, M., Clari, M., & Maresca, P. (2023). Designing immersive learning for people with visual impairments: A review of current approaches. *Disability and Rehabilitation: Assistive Technology*, 18(4), 371–385. https://doi.org/10.1080/17483107.2022.2046789

18. Crogman, H. T., Cano, V. D., Pacheco, E., Sonawane, R. B., & Boroon, R. (2025). Virtual reality, augmented reality, and mixed reality in experiential learning: Transforming educational paradigms. *Education Sciences, 15*(3), 303. https://doi.org/10.3390/educsci15030303

19. Conner, N. O., Freeman, H. R., Jones, J. A., Luczak, T., Carruth, D., Knight, A. C., & Chander, H. (2022). Virtual reality induced symptoms and effects: Concerns, causes, assessment & mitigation. *Virtual Worlds, 1*(2), 130–146. https://doi.org/10.3390/virtualworlds1020008

20. Deb, S., & Deb, S. (2025). Mental health status of school students in India: The role of school-based family counselling. *Journal of Psychologists and Counsellors in Schools, 35*(1), 78–88. https://doi.org/10.1177/20556365251321202

21. Decristan, J., Jansen, N. C., & Fauth, B. (2023). Student participation in whole-class discourse: Individual conditions and consequences for student learning in primary and secondary school. *Learning and Instruction, 86*, 101748. https://doi.org/10.1016/j.learninstruc.2023.101748

22. Di Lieto, M. C., Inguaggiato, E., Castro, E., Cecchi, F., Cioni, G., Dell'Omo, M., Laschi, C., Pecini, C., Santerini, G., Sgandurra, G., & Dario, P. (2017). Educational robotics intervention on executive functions in preschool children: A pilot study. *Computers in Human Behavior, 71*, 16–23.

https://doi.org/10.1016/j.chb.2017.01.006

23. Doolani, S., Wessels, C., Kanal, V., Sevastopoulos, C., Jaiswal, A., Nambiappan, H., & Makedon, F. (2020). A review of extended reality (XR) technologies for manufacturing training. *Technologies, 8*(4), 77. https://doi.org/10.3390/technologies8040077

24. Donitsa-Schmidt, S., & Zuzovsky, R. (2018). The effect of formal, nonformal and informal learning on teachers' promotion to middle leadership roles in schools. *International Journal of Leadership in Education, 23*(4), 371–387. https://doi.org/10.1080/13603124.2018.1508754

25. Fan, L., Wang, J., Li, Q., Song, Z., Dong, J., Bao, F., & Wang, X. (2023). Eye movement characteristics and visual fatigue assessment of virtual reality games with different interaction modes. *Frontiers in Neuroscience, 17*, 1173127. https://doi.org/10.3389/fnins.2023.1173127

26. Galhotra, B., Seth, S., Lowe, D., & Sharma, S. (2024). Technological integration in higher education: Insights from the Indian context. *Journal of Informatics Education and Research, 4*(2). https://doi.org/10.52783/jier.v4i2.1129

27. Gupta, A. (2024). Coached habitus: Mapping the role of shadow education in shaping students' educational trajectories. *British Educational Research Journal*. Advance online publication. https://doi.org/10.1002/berj.4085

28. Ibrahim, R., Alfalqi, K., & Al-Badarneh, H. (2017). Augmented reality in language learning: Effects on retention and enjoyment. *International Journal of Emerging Technologies in Learning, 12*(11), 4–15. https://doi.org/10.3991/ijet.v12i11.7286

29. Jha, S. K. (2018). Distributive responses to a collective responsibility: The right to education in India. *International Journal of Educational Development, 32*, 35–50.

30. Kapur, R. (2022). Inadequate teaching-learning methods and materials: Impediments in promoting student learning. *ResearchGate*. https://www.researchgate.net/publication/366577774_Inadequate_Teaching-Learning_Methods_and_Materials_Impediments_in_Promoting_Student_Learning

31. Kholisah, N., Saskia, B., Dinarti, N., Rohmatilahi, L., & Rostika, D. (2024). Analysis of the impact of lack of classrooms on students' conductivity while learning. *Progres Pendidikan, 5*(2), 134–138. https://doi.org/10.29303/prospek.v5i2.408

32. Klingenberg, S., Bosse, R., Mayer, R. E., Makransky, G., & Petersen, G. B. (2024). Does embodiment in virtual reality boost learning transfer? Testing an immersion-interactivity framework. *Educational Psychology Review, 36*, Article 116. https://doi.org/10.1007/s10648-024-09956-0

33. Koç, A., & Kanadlı, S. B. (2025). Effect of augmented reality on science achievement: A meta-analysis study. *Education and Information Technologies, 30*(3), 4527–4554. https://doi.org/10.1007/s10639-024-13075-4

34. Krajčovič, M., Gabajová, G., Matys, M., Furmannová, B., & Dulina, Ľ. (2022). Virtual reality as an immersive teaching aid to enhance the connection between education and practice. *Sustainability, 14*(15), 9580. https://doi.org/10.3390/su14159580

35. Kumar, S. (2023, June 15). Has coaching subjugated teaching in India? *Times of India*. https://timesofindia.indiatimes.com/readersblog/spiritedparagons/has-coaching-subjugated-teaching-in-india-51976/

36. Kumar, R., & Selva Ganesh, R. (2022). Dealing with online and blended education in India. *Decision, 49*(2), 195–201. https://doi.org/10.1007/s40622-022-00320-1

37. Kumari, J. (2016). Public–private partnerships in education: An analysis with special reference to

Indian school education system. *International Journal of Educational Development, 47*, 47–53. https://doi.org/10.1016/j.ijedudev.2015.11.017

38. Kuznetcova, I., Tilak, S., Wen, Z., Glassman, M., Anderman, E. M., & Lin, T.-J. (2023). Making immersive storytelling accessible: Interactive low-tech implementation in elementary school civic learning. *Convergence: The International Journal of Research into New Media Technologies, 31*(1), 1–33. https://doi.org/10.1177/13548565231199967

39. La Belle, T. J. (1982). Formal, nonformal and informal education: A holistic perspective on lifelong learning. *International Review of Education, 28*(2), 159–175. https://doi.org/10.1007/BF00598444

40. Lee, K. (2012). Augmented reality in education and training. *TechTrends, 56*(2), 13–21. https://doi.org/10.1007/s11528-012-0559-3

41. Leong, W. Y. (2025). Fostering creative thinking using immersive virtual reality in education. *Educational Innovations and Emerging Technologies, 4*(3), 8–25. https://doi.org/10.35745/eiet2024v04.03.0002

42. Lin, L., Yu, L., Lee, S., Zhang, Z., Wang, Y., & Chang, H. (2023). The use of virtual reality in medical education: A systematic review. *BMC Medical Education, 23*, 592. https://doi.org/10.1186/s12909-023-04762-z

43. Liu, C., Meng, S., Zheng, W., Zhang, Y., & Li, H. (2025). Research on the impact of immersive virtual reality classroom on student experience and concentration. *Virtual Reality, 29*(1), 82. https://doi.org/10.1007/s10055-025-01153-w

44. Liu, Q., Yu, Y., & Li, J. (2024). Enhancing student engagement with virtual reality applications: A case study in higher education. *Journal of Educational Computing Research, 62*(1), 59–76. https://doi.org/10.1177/07356331231199785

45. Liu, R., Wang, L., Koszalka, T. A., & Wan, K. (2022). Effects of immersive virtual reality classrooms on students' academic achievement, motivation and cognitive load in science lessons. *Journal of Computer Assisted Learning, 38*(5), 1422–1433. https://doi.org/10.1111/jcal.12688

46. Maffea, J. (2020). *Lack of resources in classrooms*. English Department: Research for Change – Wicked Problems in Our World (Paper 38). Kutztown University of Pennsylvania. https://research.library.kutztown.edu/wickedproblems/38

47. Mahmood, A., & Mazahir, S. (2023). The rise of immersive technologies in Indian classrooms: Challenges and opportunities. *Journal of Interactive Media in Education, 2023*(1), 1–14. https://doi.org/10.5334/jime.750

48. Makransky, G., & Petersen, G. B. (2021). The Cognitive Affective Model of Immersive Learning (CAMIL): A theoretical research-based model of learning in immersive virtual reality. *Educational Psychology Review, 33*(3), 937–958. https://doi.org/10.1007/s10648-020-09586-2

49. Manna, P., & Jain, S. (2024). Shadow education and academic achievement in Indian secondary schools: A mixed methods study. *Journal of Comparative and International Education, 54*(2), 275–293. https://doi.org/10.1080/03057925.2023.2281442

50. Marougkas, A., Troussas, C., Krouska, A., Alexandropoulos, C., & Virvou, M. (2024). How personalized and effective is immersive virtual reality in education? A systematic literature review for the last decade. *Multimedia Tools and Applications, 83*(17), 18185–18233. https://doi.org/10.1007/s11042-023-15986-7

51. Mazloumi Gavgani, A., Walker, F. R., Hodgson, D. M., & Nalivaiko, E. (2018). A comparative study of cybersickness during exposure to virtual reality and "classic" motion sickness: Are they different?

Journal of Applied Physiology, 125(6), 1670–1680. https://doi.org/10.1152/japplphysiol.00338.2018

52. Ministry of Education, Government of India. (2020). *National Education Policy 2020*. https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf

53. Miseliunaite, B., Kliziene, I., & Cibulskas, G. (2022). Can Holistic Education Solve the World's Problems: A Systematic Literature Review. *Sustainability*, *14*(15), 9737. https://doi.org/10.3390/su14159737

54. Mudau, A. V. (2013). A conceptual framework for analysing teaching difficulties in the science classroom. *Mediterranean Journal of Social Sciences, 4*(13), 637–646. https://doi.org/10.5901/mjss.2013.v4n13p125

55. Mukherjee, A., & Banerjee, A. (2025). Exploring the use of immersive virtual reality in teacher training programs in India. *Educational Technology Research and Development, 73*, 65–89. https://doi.org/10.1007/s11423-024-10327-7

56. Mupa, P., & Chinooneka, T. I. (2015). Factors contributing to ineffective teaching and learning in primary schools: Why are schools in decadence? *Journal of Education and Practice, 6*(19), 125-134. http://www.iiste.org/Journals/index.php/JEP/article/view/20244

57. Mystakidis, S., Fragkaki, M., & Filippousis, G. (2021). Ready Teacher One: Virtual and Augmented Reality Online Professional Development for K-12 School Teachers. *Computers*, *10*(10), 134. https://doi.org/10.3390/computers10100134

58. Nash, R. A., & Winstone, N. E. (2017). Responsibility-sharing in the giving and receiving of assessment feedback. *Frontiers in Psychology, 8*, 1519. https://doi.org/10.3389/fpsyg.2017.01519

59. Panicker, P. (2020). *Exploring cultural challenges to implementing educational technology in the higher education sector in India* (Preprint). arXiv. https://doi.org/10.48550/arXiv.2005.11020

60. OECD. (2014). *PISA 2012 results: What students know and can do*. OECD Publishing. https://doi.org/10.1787/9789264208780-en

61. Paul, U. (2024). The relevance of Right to Education Act (RTE Act) 2009 for promoting inclusive education in West Bengal, India. *EPRA International Journal of Multidisciplinary Research (IJMR), 10*(4). https://doi.org/10.36713/epra16614

62. Pavlova, E., & Pundak, D. (2024). Virtual reality as a tool for improving science learning outcomes: A meta-analysis. *Educational Research Review, 42*, 100456. https://doi.org/10.1016/j.edurev.2024.100456

63. Peney, T., & Skarratt, P. A. (2024). Increasing the immersivity of 360° videos facilitates learning and memory: Implications for theory and practice. *Educational Technology Research and Development, 72*(4), Article 10402. https://doi.org/10.1007/s11423-024-10402-9

64. Phelps, T., & Ellis, R. (2024). Technology-enhanced learning in Indian higher education: A systematic review. *Asian Journal of Distance Education, 19*(1), 43–62. https://doi.org/10.5281/zenodo.7866994

65. Poupard, M., Larrue, F., Sauzéon, H., & Tricot, A. (2024). A systematic review of immersive technologies for education: Learning performance, cognitive load and intrinsic motivation. *British Journal of Educational Technology*. Advance online publication. https://doi.org/10.1111/bjet.13503

66. PTI. (2025, May 6). *MP Board 12th result 2025: Two MPBSE students die by suicide after exam results*. Times of India. https://timesofindia.indiatimes.com/articleshow/120936776.cms

67. Qiao, H., Zhao, Y., & Xu, B. (2024). Immersive virtual reality in STEM education: A systematic review and meta-analysis. *Computers & Education, 202*, 104783. https://doi.org/10.1016/j.compedu.2023.104783

68. Rauschnabel, P. A., Felix, R., Hinsch, C., Shahab, H., & Alt, F. (2022). What is XR? Towards a framework for augmented and virtual reality. *Computers in Human Behavior, 134*, Article 107289. https://doi.org/10.1016/j.chb.2022.107289

69. Rizvi, S., & Ali, M. (2023). Virtual reality in Indian education: Emerging trends and future directions. *Journal of Educational Technology Systems, 52*(2), 237–258. https://doi.org/10.1177/00472395231156543

70. Roy, S., & Ghosh, P. (2024). Student perceptions of virtual reality-based learning in Indian higher education. *International Journal of Educational Technology in Higher Education, 21*, Article 7. https://doi.org/10.1186/s41239-024-00340-8

71. Sajida, & Kusumasari, B. (2023). Critical success factors of public–private partnerships in the education sector. *Public Administration and Policy, 26*(3), 309–320. https://doi.org/10.1108/PAP-11-2022-0127

72. Santos, M. E. C., Lübke, A. I. W., Taketomi, T., Yamamoto, G., Rodrigo, M. M. T., Sandor, C., & Kato, H. (2016). Augmented reality as multimedia: The case for situated vocabulary learning. *Research and Practice in Technology Enhanced Learning, 11*(1), 4. https://doi.org/10.1186/s41039-016-0028-2

73. Schneider, S., Wessels, A., & Pilz, M. (2023). Theory and practice of teaching and learning in the classroom – Lessons from Indian industrial training institutes. *Vocations and Learning, 16*(1), 99–120. https://doi.org/10.1007/s12186-022-09305-8

74. Seo, S., Park, H., & Koo, C. (2024). Impact of interactive learning elements on personal learning performance in immersive virtual reality for construction safety training. *Expert Systems with Applications, 251*, 124099. https://doi.org/10.1016/j.eswa.2024.124099

75. Serrano-Ausejo, E., & Mårell-Olsson, E. (2024). Opportunities and challenges of using immersive technologies to support students' spatial ability and 21st-century skills in K–12 education. *Education and Information Technologies, 29*(4), 5571–5597. https://doi.org/10.1007/s10639-023-11981-5

76. Seth, S., Sharma, S., Lowe, D., & Galhotra, B. (2024). Technological integration in higher education: Insights from the Indian context. *Journal of Informatics Education and Research, 4*(2). https://doi.org/10.52783/jier.v4i2.1129

77. Sharma, S. K. (2025). Public–private partnerships (PPP) in higher education funding: Success stories and lessons learned in the Indian context. *Iconic Research and Engineering Journals, 8*(12), 1303–1311. https://www.irejournals.com/paper-details/1709197

78. Shekhawat, B. S., Meena, D., Yadav, S., Dhaka, V., & Vignesh, K. (2023). Stress and coping strategy among coaching and non-coaching students in Kota: A comparative study. *Indian Psychiatry Journal, 32*(Suppl 1), S105–S111. https://doi.org/10.4103/ipj.ipj_203_23

79. Silseth, K., Steier, R., & Arnseth, H. C. (2024). Exploring students' immersive VR experiences as resources for collaborative meaning making and learning. *International Journal of Computer-Supported Collaborative Learning, 19*(1), 11–36. https://doi.org/10.1007/s11412-023-09413-0

80. Simón-Vicente, L., Rodríguez-Cano, S., Delgado-Benito, V., Ausín-Villaverde, V., & Cubo Delgado, E. (2024). Cybersickness: A systematic literature review of adverse effects related to virtual reality. *Neurología (English Edition), 39*(8), 701–709. https://doi.org/10.1016/j.nrleng.2022.04.007

81. Singh, S., & Kumar, N. (2024). Effectiveness of augmented reality learning tools in Indian schools: A review. *Journal of Computer Assisted Learning, 40*(2), 281–294. https://doi.org/10.1111/jcal.12541

82. Skarbez, R., Brooks, F. P., Jr., & Whitton, M. C. (2017). A survey of presence and related concepts. *ACM Computing Surveys, 50*(6), Article 96. https://doi.org/10.1145/3134301

83. Song, C., Shin, S.-Y., & Shin, K.-S. (2023). Optimizing Foreign Language Learning in Virtual Reality: A Comprehensive Theoretical Framework Based on Constructivism and Cognitive Load Theory (VR-CCL). *Applied Sciences*, *13*(23), 12557. https://doi.org/10.3390/app132312557

84. Stavroulia, K. E., & Lanitis, A. (2023). The role of perspective-taking on empowering the empathetic behavior of educators in VR-based training sessions: An experimental evaluation. *Computers & Education, 197*, 104739. https://doi.org/10.1016/j.compedu.2023.104739

85. Sullivan, F. R. (2008). Tracing the development of mental models of simple mechanical systems. *International Journal of Science Education, 30*(14), 1803–1830. https://doi.org/10.1080/09500690701505229

86. Susuoroka, G., Jagri, B. B., Mohammed, A. A., Anass, A. A., Abdul-Mumin, A., Agyei, E., & Domonaamwin, C. B. (2021). Factors affecting efficient teaching and learning of mathematics in senior high schools in Wa. *Teacher Education and Curriculum Studies, 6*(3), 41-51. https://doi.org/10.11648/j.tecs.20210603.11

87. Times of India. (2023, July 10). Why open schooling in demand in Karnataka now? Extra time to prepare for entrance exams. *Times of India.* https://timesofindia.indiatimes.com/city/bengaluru/why-open-schooling-in-demand-in-karnataka-now-extra-time-to-prepare-for-entrance-exams/articleshow/121809493.cms

88. Thomas, M., & Sharma, R. (2023). Virtual reality in Indian classrooms: A tool for inclusive education. *Education and Information Technologies, 28*(6), 12355–12375. https://doi.org/10.1007/s10639-023-11689-0

89. UNESCO. (n.d.). SDG 4 – Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. *Education 2030*. UNESCO. Retrieved August 1, 2025, from https://www.unesco.org/sdg4education2030/en

90. United Nations. (n.d.). *Education is a human right*. United Nations. https://www.un.org/en/academic-impact/education-human-right

91. Verma, S., Sachdeva, M., & Bajpai, A. (2023). Changing horizon in teaching profession in India: Issues and challenges. *Annals of Neurosciences, 32*(3), 153–160. https://doi.org/10.1177/09727531231208290

92. Wang, X., & Wu, D. (2024). Impact of immersive virtual reality on student motivation and learning outcomes in Indian higher education. *Journal of Educational Multimedia and Hypermedia, 33*(1), 45–68.

93. Wang, X.-N., Quirke, M., & Mc Guckin, C. (2022). The importance of social competence for 21st century citizens: The use of mixed reality for social competence learning in mainstream education. In A. De Pace (Ed.), *Methodologies and use cases on extended reality for training and education* (pp. 242–268). IGI Global. https://doi.org/10.4018/978-1-6684-3398-0.ch010

94. Xu, Y., & Tan, C. (2024). Exploring the role of virtual reality in student collaboration and engagement. *Computers & Education, 204*, 104822. https://doi.org/10.1016/j.compedu.2023.104822

95. Yang, C., Zhang, J., Hu, Y., & Zhao, Q. (2024). The impact of virtual reality on practical skills for students in science and engineering education: A meta-analysis. *International Journal of STEM Education, 11*, 28. https://doi.org/10.1186/s40594-024-00487-2

96. Yang, H., Cai, M., Diao, Y., Liu, R., Liu, L., & Xiang, Q. (2023). How does interactive virtual reality enhance learning outcomes via emotional experiences? A structural equation modeling approach. *Frontiers in Psychology, 13*, Article 1081372. https://doi.org/10.3389/fpsyg.2022.1081372

97. Zhang, J., Xu, J., & Li, M. (2025). *The impact of educational live action role-playing games on social–emotional competence: A mixed-method study with Chinese college students*. *Frontiers in Psychology, 16*, Article 1538761. https://doi.org/10.3389/fpsyg.2025.1538761

98. Zulfiqar, F., Raza, R., Khan, M. O., Arif, M., Alvi, A., & Alam, T. (2023). Augmented reality and its applications in education: A systematic survey. *IEEE Access, 11*, 1–1. https://doi.org/10.1109/ACCESS.2023.3331218