

Attitude Towards The Integration Of Augmented Reality And Virtual Reality Into Teaching And Learning Among Prospective Teachers

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Abstract

The integration of Augmented Reality (AR) and Virtual Reality (VR) has emerged as a transformative innovation in education, offering immersive, interactive and learner-centered instructional experiences. The successful implementation of these technologies in classrooms depends largely on prospective teachers' attitudes toward their educational use. The present study investigated the attitudes of prospective teachers towards the integration of AR and VR into teaching and learning and examined whether significant differences existed based on selected demographic variables. A normative survey method was adopted for the study. The sample comprised 300 prospective teachers selected through stratified random sampling from Government, Government-aided, and Private Colleges of Education in Chennai and Tiruvallur districts of Tamil Nadu, India. Data were collected using the Attitude towards AR/VR Integration Scale (ATAVIS), a standardized instrument consisting of 40 Likert-type items with high reliability (0.982) and intrinsic validity (0.990). The collected data were analyzed using percentage analysis, mean, standard deviation, independent samples t-test and one-way ANOVA. The findings revealed that the majority of prospective teachers (75.22%) exhibited a moderate level of attitude towards the integration of AR/VR in teaching and learning. Significant differences were observed with respect to gender, locality, medium of study, academic stream, and type of management. Female, Urban, English-medium, Science-stream and Private college prospective teachers demonstrated significantly more positive attitudes towards AR/VR integration than their counterparts. The study highlights the need for enhanced technological infrastructure, systematic professional training and curriculum reforms in teacher education institutions to promote the effective integration of immersive technologies into classroom practices. The findings provide valuable implications for teacher educators, curriculum developers and policymakers seeking to strengthen digital competency and technology-enabled pedagogy in teacher education.

Keywords: Augmented Reality (AR), Virtual Reality (VR), Prospective Teachers, Teaching and Learning, Attitude towards Technology Integration, Teacher Education, Educational Technology, Integration of AR/VR

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I. Introduction

The rapid advancement of digital technologies has transformed educational practices by creating opportunities for more interactive, engaging, and learner-centered teaching approaches. Among these technologies, Augmented Reality (AR) and Virtual Reality (VR) have emerged as innovative instructional tools that enhance learning through immersive and experiential environments. AR overlays digital information onto the real-world environment, while VR creates fully simulated environments that enable learners to interact with virtual objects and situations. Research has demonstrated that these technologies improve learner engagement, conceptual understanding, motivation, and higher-order thinking skills, making them valuable resources for twenty-first-century education (Ibáñez & Delgado-Kloos, 2018; Radianti et al., 2020). The effective integration of AR and VR into classroom instruction depends largely on teachers' readiness, competence and attitudes toward technology adoption. Prospective teachers, as future educators, play a pivotal role in determining the successful implementation of these emerging technologies in schools. The present study is grounded in the Technological Pedagogical Content Knowledge (TPACK) Framework proposed by Mishra and Koehler (2006), which posits that effective technology integration occurs through the interaction of technological knowledge, pedagogical knowledge, and content knowledge. According to the TPACK framework, teachers require not only technological skills but also the ability to integrate technology meaningfully with appropriate pedagogy and subject content. Therefore, developing positive attitudes toward AR and VR is essential for preparing prospective teachers to implement innovative instructional practices effectively.

Although numerous studies have highlighted the educational benefits of AR and VR, research examining prospective teachers' attitudes toward these technologies remains limited, particularly within the

Indian teacher education context. Existing studies have focused primarily on learning outcomes and technology effectiveness rather than teachers' readiness to integrate immersive technologies into classroom practice. Furthermore, background variables such as gender, locality, medium of study, academic stream and institutional management may influence teachers' attitudes toward technology integration. Against this backdrop, the present study investigates the attitudes of prospective teachers toward the integration of Augmented Reality and Virtual Reality in teaching and learning and examines whether these attitudes differ across selected demographic variables. The findings are expected to provide empirical evidence to support curriculum development, teacher education programmes, and educational policies aimed at strengthening technology-enabled teaching and learning.

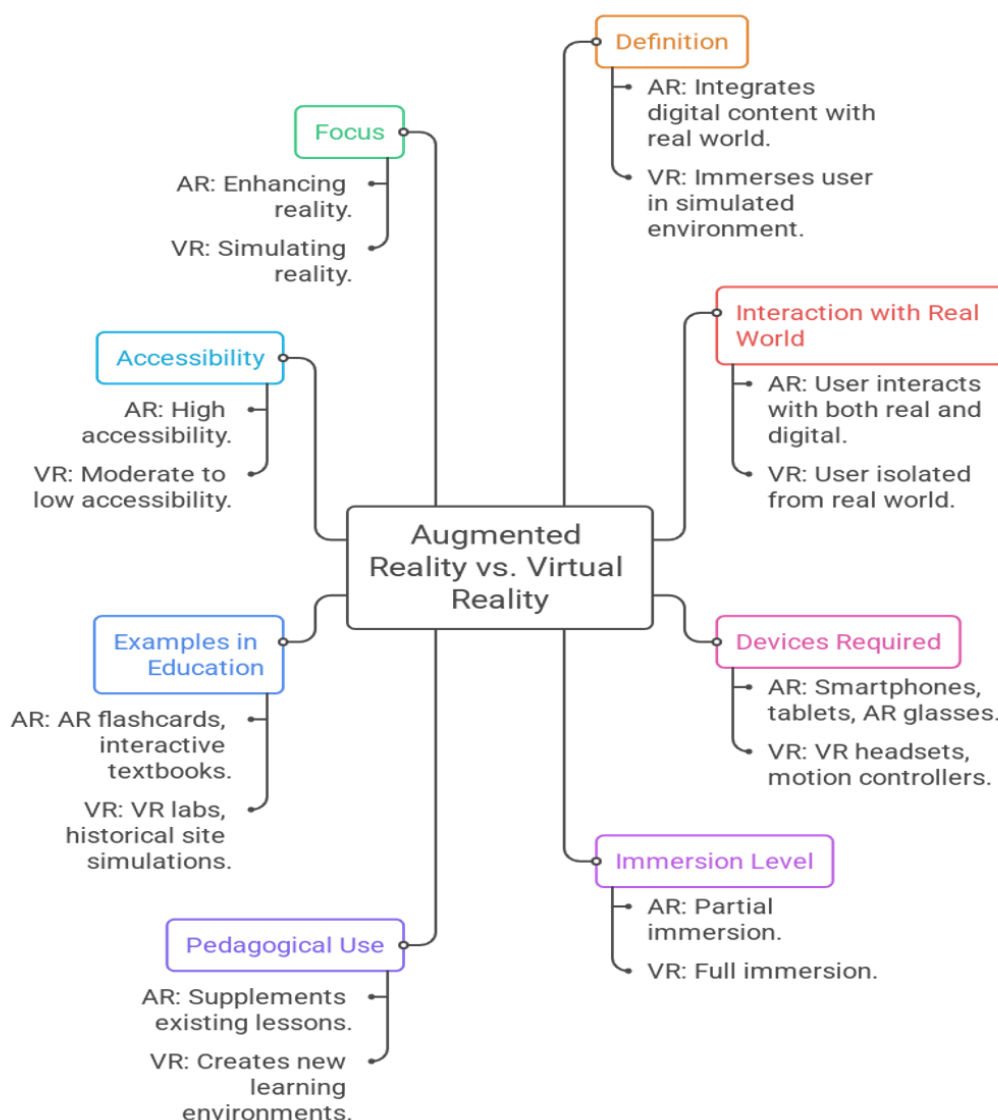


Figure 1: Augmented Reality vs. Virtual Reality in Education

II. Review Of Literature

Recent research has consistently highlighted the educational value of Augmented Reality (AR) and Virtual Reality (VR) in enhancing teaching and learning. Radianti et al. (2020) systematically reviewed immersive VR applications in higher education and concluded that VR promotes experiential learning, learner engagement, and collaborative learning while improving conceptual understanding. Hamilton et al. (2021) further reported that immersive VR positively influences learning outcomes, particularly when instructional design is grounded in sound pedagogical principles. More recently, Garzón & Acevedo, Scherer et al., (2019), Akçayır & Akçayır (2017), conducted a systematic review of Extended Reality (XR), encompassing AR, VR, and Mixed Reality (MR), in teacher education and found that immersive technologies significantly improve pre-service teachers' pedagogical competence, classroom management skills, reflective practice and teaching

confidence. However, the review also emphasized that effective implementation depends on adequate technological infrastructure, instructional support and well-designed teacher preparation programmes and studies have also emphasized that teachers' attitudes, self-efficacy and readiness are critical determinants of successful AR and VR integration in educational settings. A systematic review by Radianti et al. (2020) and Hamilton et al. (2021) reported a moderate positive effect of VR-based interventions in teacher education and concluded that immersive technologies enhance professional competencies, practical teaching skills and reflective learning among both pre-service and in-service teachers. Similarly, Tondeur et al. (2017) and Scherer et al. (2019) found that although immersive technologies have considerable potential to transform teacher education, research focusing specifically on prospective teachers remains limited, and challenges such as insufficient training, infrastructure constraints, and limited institutional support continue to hinder widespread adoption. These findings indicate a need for further empirical investigations into prospective teachers' attitudes toward AR and VR integration, particularly within the Indian teacher education context, where evidence remains relatively scarce.

Need And Significance Of The Study

The rapid advancement of Augmented Reality (AR) and Virtual Reality (VR) technologies has created new opportunities to enhance teaching and learning through immersive, interactive, and learner-centered educational experiences. Despite their demonstrated potential to improve student engagement, conceptual understanding, and learning outcomes, their successful integration in educational settings largely depends on teachers' attitudes, readiness, and technological competence. As prospective teachers are the future implementers of innovative pedagogical practices, understanding their attitudes toward AR and VR is essential for promoting effective technology integration in schools. In the Indian teacher education context, empirical research examining prospective teachers' attitudes toward AR and VR remains limited, creating a gap in evidence-based knowledge. Therefore, this study is significant because it provides insights into prospective teachers' readiness to adopt immersive technologies and identifies variations across demographic characteristics. The findings will assist teacher educators, curriculum developers, educational institutions, and policymakers in designing appropriate training programmes, strengthening digital competencies, and developing strategies for the effective integration of AR and VR into teacher education and classroom practice.

Objectives

1. To analyze the level of Attitude towards the Integration of AR/VR into Teaching and Learning among Prospective Teachers.
2. There is no significant difference in Attitude towards the Integration of AR/VR into Teaching and Learning among Prospective Teachers with respect to
 - (a) Gender
 - (b) Locality
 - (c) Medium of study
 - (d) Academic Streams
 - (e) Type of Management

Hypotheses

1. There is no significant difference in Attitude towards the Integration of AR/VR into Teaching and Learning among prospective teachers based on gender.
2. There is no significant difference in Attitude towards the Integration of AR/VR into Teaching and Learning among prospective teachers based on locality.
3. There is no significant difference in Attitude towards the Integration of AR/VR into Teaching and Learning among prospective teachers based on medium of study.
4. There is no significant difference in Attitude towards the Integration of AR/VR into Teaching and Learning among prospective teachers based on academic stream.
5. There is no significant difference in Attitude towards the Integration of AR/VR into Teaching and Learning among prospective teachers based on type of management.

III. Methodology Of The Study

Research Design

The study adopted a normative survey method, appropriate for describing existing conditions and examining relationships among variables in a large population.

Population and Sample

The population consisted of prospective teachers (B.Ed. student teachers) studying in Colleges of Education located in Chennai and Tiruvallur districts of Tamil Nadu. A sample of 300 prospective teachers was selected through stratified random sampling.

Instrumentation

Data were collected using the Attitude towards AR/VR Integration Scale (ATAVIS-2026) was constructed and validated by Dr.P.Pachaiyappan. The question consists of 40 items, each to be rated on the five-point likert scale. Each statement has five options viz. Strongly Agree (SA), Agree (A), Undecided (UN), Disagree (DA) and Strongly Disagree (SDA) out of which one has to be selected. The weightage is given as 5,4,3,2 and 1 for alternatives SA, A, UN, DA and SDA respectively.

Reliability and Validity

- Test-retest reliability coefficient: 0.982
- Intrinsic validity coefficient: 0.990

These values indicate that the instrument possesses excellent reliability and validity.

Statistical Techniques Used

The collected data were analyzed using:

Mean and Standard Deviation, Independent sample t-test and One-way ANOVA.

IV. Data Analysis And Interpretation

Table 1: The level of Attitude towards the Integration of AR/VR into Teaching and Learning among Prospective Teachers

Level of Attitude towards Integration of AR/VR	Frequency	Percentage
Low	21	8.97%
Moderate	176	75.22%
High	37	15.81%

From the above table result reveals that 8.97% and 15.81% prospective teachers have low and high level of Attitude towards the Integration of AR/VR into Teaching and Learning respectively and most of the prospective teachers have moderate level (75.22%) of Attitude towards the Integration of AR/VR into Teaching and Learning.

Figure 2: The level of Attitude towards the Integration of AR/VR into Teaching and Learning among Prospective Teachers

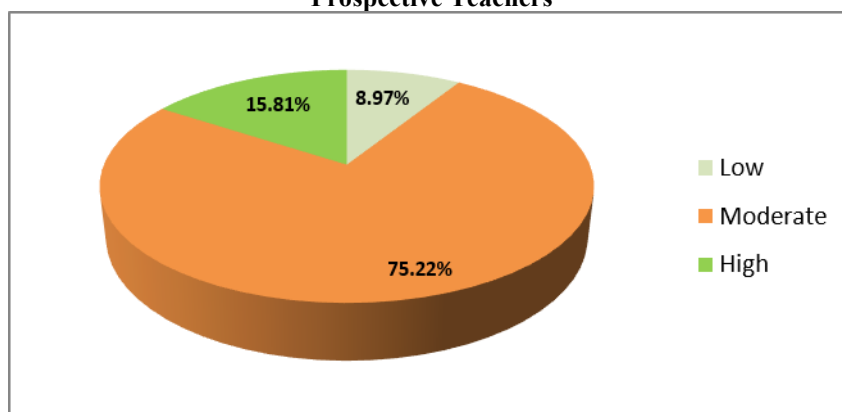


Table 2: Attitude towards the Integration of AR/VR into Teaching and Learning among Prospective Teachers based on Gender

Gender	N	Mean	Std. Deviation	t-value	Level of Significance
Male	143	168.03	27.050	3.711	0.01
Female	157	178.13	18.924		

From the above table, the calculated 't' value is 3.711 greater than the table value (2.58). It is found that there is a significant difference between the male and female prospective teachers Attitude towards the Integration of AR/VR into Teaching and Learning. Hence the null hypothesis is rejected.

Table 3: Attitude towards the Integration of AR/VR into Teaching and Learning among Prospective Teachers based on Locality

Locality	N	Mean	Std. Deviation	t-value	Level of Significance
Rural	113	174.85	21.361	4.281	0.01
Urban	187	184.45	17.129		

From the above table, the calculated 't' value is 4.281 greater than the table value (2.58). It is found that there is a significant difference between the Rural and Urban prospective teachers with respect to Attitude towards the Integration of AR/VR into Teaching and Learning. Hence the null hypothesis is rejected.

Table 4: Attitude towards the Integration of AR/VR into Teaching and Learning among Prospective Teachers based on Medium of Study

Medium of Study	N	Mean	Std. Deviation	t-value	Level of Significance
Tamil	167	166.03	25.743	5.796	0.01
English	133	181.40	18.490		

From the above table, the calculated 't' value is 5.796 greater than the table value (2.58). It is found that there is a significant difference between the Tamil and English Medium prospective teachers with respect to their Attitude towards the Integration of AR/VR into Teaching and Learning. Hence the null hypothesis is rejected.

Table 5: Attitude towards the Integration of AR/VR into Teaching and Learning among Prospective Teachers based on the Academic Stream

Academic Stream	N	Mean	Std. Deviation	t-value	Level of Significance
Arts	141	164.05	26.389	6.350	0.01
Science	159	180.64	18.582		

From the above table, the calculated 't' value is 6.350 greater than the table value (2.58). It is found that there is a significant difference between the Arts and Science Stream prospective teachers with respect to their Attitude towards the Integration of AR/VR into Teaching and Learning. Hence the null hypothesis is rejected.

Table 6: ANOVA for Attitude towards the Integration of AR/VR into Teaching and Learning among Prospective Teachers based on Type of Management

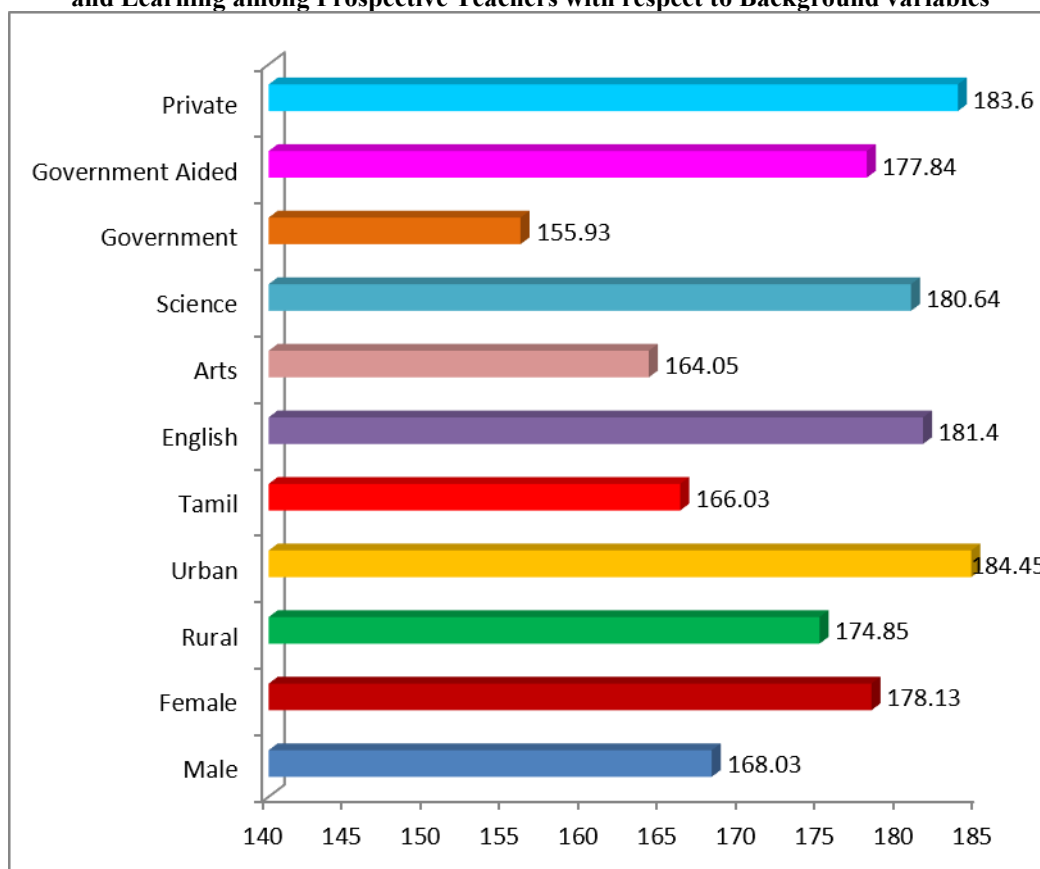
Attitude towards Integration of AR/VR	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	42090.533	2	21045.266	47.883	0.01
Within Groups	130535.104	297	439.512		
Total	172625.637	299			

Table 6.1: Difference in the Attitude towards the Integration of AR/VR into Teaching and Learning among Prospective Teachers based on Type of Management

Type of Management	N	Mean	F-value	Level of Significance
Government	96	155.93	47.883	0.01
Government Aided	99	177.84		
Private	105	183.60		

From the above table, the calculated 'F'-value is 47.883 greater than the table value (4.60). It is found that there is a significant difference among the Government, Government Aided and Private College prospective teachers with respect to their Attitude towards the Integration of AR/VR into Teaching and Learning. Hence the null hypothesis is rejected.

Figure 3: Bar diagram shows mean values of Attitude towards the Integration of AR/VR into Teaching and Learning among Prospective Teachers with respect to Background variables



V. Major Findings Of The Study

- ❖ **Overall Attitude towards AR and VR Integration:** The majority (75.22%) of prospective teachers have a moderate attitude towards the integration of AR and VR in teaching and learning. Only 8.97% exhibited a low level of attitude, while 15.81% demonstrated a high level of attitude.
- ❖ **Gender Difference:** There is a notable difference between male and female prospective teachers regarding their attitude towards AR/VR integration. Female prospective teachers demonstrate a more positive attitude compared to their male counterparts.
- ❖ **Locality Differences:** Prospective teachers from urban areas tend to have a more favorable attitude towards AR and VR integration than those from rural areas, reflecting a potential disparity in access to technology.
- ❖ **Medium of Study:** Prospective teachers who studied in English medium institutions generally exhibit a more positive attitude towards the integration of AR/VR than those who studied in Tamil medium institutions.
- ❖ **Academic Stream Differences:** Science stream prospective teachers tend to have a more positive attitude towards AR/VR integration compared to those from the Arts stream.
- ❖ **Type of Management:** Prospective teachers from private colleges have a significantly more positive attitude towards AR/VR integration than those from government or government-aided colleges.

VI. Educational Implications

The findings of this study underscore the importance of tailoring educational interventions to address the varying attitudes towards AR/VR integration among prospective teachers. Since urban teachers tend to have a more positive outlook, it is essential to ensure that rural teachers receive the necessary training and resources to bridge this gap. Providing rural schools with access to AR/VR technology and offering localized workshops could help these teachers feel more confident in utilizing such innovations. Similarly, the difference in attitudes between English and Tamil medium teachers suggests that language-specific training materials and programs should be developed, enabling all teachers to fully engage with AR/VR tools, regardless of their medium of instruction.

The study highlights that gender, academic stream and type of management play crucial roles in shaping teachers' attitudes towards AR/VR integration. Educational institutions should design gender-inclusive professional development programs that encourage male teachers to embrace technological advancements,

while also nurturing the existing enthusiasm among female teachers. The positive attitude of Science stream teachers suggests that discipline-specific training and support should be provided to Arts stream teachers, who may benefit from understanding how AR/VR can enhance teaching in the humanities. Furthermore, private colleges appear to have a more favorable view of AR/VR, suggesting that government and government-aided institutions should invest in similar technology-driven initiatives and foster a culture of innovation to ensure widespread adoption across all sectors.

VII. Conclusion

This study provides valuable insights into the attitudes of prospective teachers towards the integration of AR/VR in teaching and learning. It reveals that while the majority of teachers have a moderate attitude, significant differences exist based on gender, locality, medium of study, academic stream, and type of management. The findings suggest that factors such as access to technology, language of instruction and the nature of teacher training programs play a crucial role in shaping teachers' perspectives. These differences highlight the need for targeted interventions that cater to the specific needs of various teacher groups to foster a more inclusive and effective use of AR/VR technologies in education. AR/VR integration to be successful across diverse educational settings, policymakers and educational institutions must focus on addressing the disparities identified in this study. This includes providing adequate resources and professional development opportunities to rural, male, and Tamil medium prospective teachers, as well as promoting stream-specific and management-oriented strategies. By doing so, the adoption of AR/VR technologies can be more effectively implemented; leading to enhanced teaching practices and improved learning outcomes for students.

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