

Virtual Reality in Education Across Cultures

A Narrative Review of Cultural, Pedagogical, and Ethical Dimensions

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Abstract. Virtual Reality is increasingly used in education to support immersive, interactive, and experiential learning. However, its adoption is influenced not only by technological capabilities but also by cultural expectations, pedagogical traditions, infrastructural conditions, and ethical considerations. This narrative review examines how these dimensions interact across diverse educational contexts and explores their implications for culturally responsive and responsible VR implementation. The review synthesised interdisciplinary literature identified through searches of Scopus, Web of Science, IEEE Xplore, SpringerLink, and Google Scholar, focusing primarily on publications from 2009 to 2024. Relevant literature addressing VR or immersive technologies in education and their cultural, pedagogical, technological, infrastructural, or ethical dimensions was thematically organised and mapped to four research questions. The findings indicate that VR adoption and learning experiences are context-dependent rather than universally consistent. Cultural frameworks can provide useful interpretive perspectives on learner expectations, interaction, autonomy, and collaboration, but should not be treated as deterministic predictors of individual behaviour. Pedagogical alignment, institutional readiness, technological accessibility, educator preparedness, learner well-being, and responsible governance are also important considerations. Overall, the review supports a context-sensitive approach to VR in education that aligns cultural, pedagogical, technological, institutional, and ethical considerations.

Keywords: Virtual Reality, Cross-Cultural, Education, Cultural Dimensions, Pedagogical Design, Technological Infrastructure, Ethical and Inclusive VR, Educational Technology.

1 Introduction

Virtual Reality (VR) has emerged as a transformative digital technology with expanding applications across education, healthcare, tourism, communication, and professional training. By enabling immersive, interactive, and simulated environments, VR supports experiential learning, skills development, and authentic practice beyond the

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constraints of physical classrooms [1,2]. In educational contexts, VR and interactive multimedia technologies have been shown to enhance learner engagement, motivation, and conceptual understanding when aligned with pedagogical objectives [3]. Regardless of expanding adoption, VR is increasingly recognised as a transformative educational technology, offering immersive and interactive environments that support experiential learning, skills development, and remote collaboration. In higher education and professional training, VR has demonstrated potential to boost learner commitment, theoretical understanding, and practical skill when integrated with pedagogically sound instructional design [1]. As institutions worldwide transition toward digitally mediated and resilient learning ecosystems, immersive technologies are becoming central to strategies for educational continuity and innovation.

Despite this growth, VR adoption and effectiveness are not culturally neutral. A substantial body of research demonstrates that learners' perceptions of digital technologies are shaped by cultural values, communication norms, and pedagogical traditions, which influence interaction styles, acceptance, and learning outcomes [4,5]. Early work by [6] highlighted the role of cultural perception in shaping trainers' skills and learner engagement in e-learning environments, emphasising that technology design and instructional strategies must align with cultural expectations. However, much of the contemporary VR literature remains dominated by Western-centric or single-context studies, often applying universal adoption models without sufficient attention to cross-cultural variability.

Despite growing adoption, current VR research reveals critical limitations related to ethics, inclusivity, and contextual responsiveness. Many VR implementations prioritise technical performance and short-term learning outcomes, while ethical considerations such as data privacy, learner well-being, and cognitive overload receive limited empirical attention. In immersive environments, prolonged exposure and extensive data collection raise concerns about psychological safety and responsible governance, particularly in large-scale educational deployments [1]. Furthermore, accessibility challenges persist, including limited multilingual support, rigid interface designs, and high bandwidth or hardware requirements, which disproportionately exclude learners from under-resourced or marginalized contexts.

In addition, disparities in educational systems and technological infrastructure further complicate VR adoption. Differences in institutional readiness, digital literacy, and access to virtual laboratories and immersive tools became particularly evident during the COVID-19 pandemic, when virtual education was adopted unevenly across regions [2]. Research on interactive multimedia adoption consistently demonstrates that successful implementation depends on alignment between internal institutional factors, external technological conditions, and pedagogical design [3]. Without such alignment, VR risks reinforcing digital inequalities rather than supporting inclusive and ethical learning practices.

A further gap lies in the scarcity of longitudinal and cross-cultural research examining how VR-supported learning evolves over time and across diverse institutional and cultural settings. While positive learning outcomes are frequently reported, few studies investigate the sustainability, adaptability, and resilience of VR-based pedagogies be-

yond short-term interventions. As highlighted by [7], the successful integration of digital learning technologies requires strategic institutional preparedness, resilience-oriented planning, and alignment with local educational and technological infrastructures. Without such context-sensitive approaches, immersive technologies risk reinforcing existing inequities rather than supporting equitable educational transformation.

In response to these gaps, the present narrative review aims to foreground ethical, inclusive, and culturally responsive dimensions of VR adoption. Specifically, it aims to investigate how ethical design principles, accessibility-oriented implementation, and institutional readiness can facilitate equitable participation in immersive learning environments. Additionally, the study emphasises the importance of longitudinal and cross-cultural research in informing adaptive VR design, policy development, and sustainable educational innovation.

By adopting a holistic and multidimensional perspective, this research positions VR not merely as a technological tool, but as a socio-technical system embedded within cultural, institutional, and ethical contexts. Such an approach contributes to the development of future-ready, resilient learning systems that can leverage immersive technologies to support inclusive and meaningful education across global settings.

Addressing these gaps, this narrative review investigates Virtual Reality Across Cultures to examine how cultural values, pedagogical traditions, infrastructural conditions, and ethical consideration shape the adoption and use of VR in education. To guide the review, the study addresses the following research questions:

- RQ1: How do cultural dimensions influence preferences for and engagement with VR learning environments across different cultural contexts?
- RQ2: What role do communication styles and pedagogical traditions play in shaping VR interaction and learning experiences?
- RQ3: How do educational and technological infrastructures affect the adoption and ethical implementation of VR in education?
- RQ4: What design and implementation principles can support culturally adaptive, inclusive, and ethically responsible VR use?

The significance of this study lies in its integration of cross-cultural theory with prior research on e-learning, interactive multimedia, and VR in education [3,8]. By foregrounding cultural, pedagogical, and ethical dimensions, the review contributes to the development of context-sensitive and ethically grounded VR frameworks capable of supporting equitable and future-ready learning systems worldwide.

This study contributes to the literature by highlighting the role of cultural, pedagogical, and ethical factors in shaping the adoption and use of virtual reality in education. By synthesizing cross-cultural evidence, the review demonstrates that learner engagement, design preferences, and ethical considerations in VR are context-dependent rather than universal. The study further extends prior research on e-learning and immersive technologies by emphasizing inclusivity, institutional readiness, and culturally adaptive design as key requirements for sustainable VR implementation. These insights provide practical guidance for educators, developers, and policymakers seeking to deploy VR in diverse educational contexts.

2 Methodology

This study adopted a narrative review methodology to examine the cultural, pedagogical, technological, and ethical dimensions of Virtual Reality use in education across diverse contexts. A narrative approach was selected because the review sought to integrate and interpret heterogeneous empirical, conceptual, and theoretical literature rather than statistically aggregate findings. This approach was particularly appropriate for the exploratory and theory-informed nature of the research questions, which required contextual interpretation of cultural values, educational practices, technological conditions, and ethical considerations.

The review was conducted as a structured narrative synthesis. The literature was identified, examined for relevance to the research objectives, categorized according to the four research questions, and synthesized thematically. This process enabled evidence from different educational, cultural, and technological contexts to be considered together while preserving the interpretive nature of a narrative review.

2.1 Literature Identification and Search Strategy

The literature search was conducted using major academic databases and scholarly sources, including Scopus, Web of Science, IEEE Xplore, SpringerLink, and Google Scholar. Literature published primarily between 2009 and 2024 was considered to incorporate both foundational work and more recent developments in VR, e-learning, interactive multimedia, and educational technology.

Searches used combinations of terms related to the four analytical dimensions of the study, including virtual reality, VR in education, culture, cross-cultural, pedagogy, communication, ethics, inclusivity, interactive multimedia, infrastructure, and educational technology. Additional relevant literature was identified through established theoretical perspectives and foundational works concerning cultural dimensions and communication patterns, including Hofstede's cultural dimensions and Hall's communication-context framework.

The search was intentionally broad enough to capture literature from different disciplines and educational settings. This breadth was consistent with the narrative review approach and supported the cross-disciplinary and cross-cultural objectives of the study.

2.2 Relevance and Selection of Literature

The identified literature was considered relevant when it contributed to at least one of the study's four research questions. Particular attention was given to studies examining VR or immersive technologies in educational contexts and to literature addressing cultural, pedagogical, communication, infrastructural, accessibility, or ethical considerations.

The review included empirical studies, conceptual contributions, theoretical discussions, and relevant review studies where these provided insight into the cultural, edu-

cational, technological, or ethical dimensions of VR use. Literature focusing exclusively on technical performance or hardware characteristics without an educational, cultural, institutional, or ethical dimension was not considered central to the synthesis.

Rather than applying rigid quantitative selection criteria, relevance was determined according to the contribution of each source to the objectives and research questions of the review. This approach allowed theoretically important and contextually relevant literature to be incorporated alongside empirical research.

2.3 Thematic Analysis and Mapping to the Research Questions

Following identification and relevance assessment, the literature was organized thematically according to the four research questions. Each source was examined in relation to the dimension of VR use that it contributed to, and relevant findings or concepts were grouped under the corresponding research question.

For RQ1, the analysis focused on cultural values and dimensions that may influence preferences for and engagement with VR learning environments. Hofstede's cultural dimensions and Hall's communication-context perspective were used as interpretive lenses for examining themes such as autonomy, collaboration, social interaction, communication, and learner expectations. These frameworks were used to support contextual interpretation rather than to assume that all individuals within a cultural group share identical preferences.

For RQ2, the analysis examined the relationship between communication styles, instructional design, and pedagogical traditions and the way learners interact with and experience VR environments. Particular attention was given to themes including narrative and contextual communication, collaboration, learner autonomy, experiential learning, instructional structure, and the role of the instructor.

For RQ3, the analysis considered the educational and technological conditions that influence VR adoption and implementation. Themes included institutional readiness, access to hardware and connectivity, technical support, digital literacy, educator preparedness, accessibility, and resource constraints. Evidence concerning virtual and resilient education, including literature emerging during and following the COVID-19 pandemic, was considered where it contributed to understanding equity and responsible implementation.

For RQ4, the literature was synthesized to identify recurring design and implementation principles relevant to culturally adaptive, inclusive, and ethically responsible VR use. Particular attention was given to cultural relevance, accessibility, inclusivity, learner autonomy, learner well-being, transparency, institutional responsibility, and governance. Recommendations reported across the literature were compared conceptually and consolidated into broader design considerations.

This thematic mapping provided an explicit link between the literature reviewed and the four research questions. It also enabled the findings to be interpreted across cultural, pedagogical, technological, and ethical dimensions rather than treating these dimensions as isolated factors.

2.4 Synthesis and Reporting

The findings were synthesized narratively by identifying recurring themes, relationships, contextual differences, and design implications across the reviewed literature. Evidence relating to each research question was first considered within its respective thematic category and was then interpreted collectively to examine relationships between culture, pedagogy, infrastructure, and ethical implementation.

The synthesis did not seek to calculate effect sizes or produce statistical estimates of VR effectiveness. Instead, it focused on identifying patterns and contextual insights reported across the literature and on interpreting how these insights may inform culturally responsive and ethically responsible VR design.

The resulting synthesis was organized according to RQ1–RQ4 and subsequently integrated into an overall interpretation of context-sensitive VR adoption. Figure 1 summarizes this review procedure, illustrating the progression from literature identification and relevance assessment through thematic categorization, research-question mapping, narrative synthesis, and the development of findings and design implications.

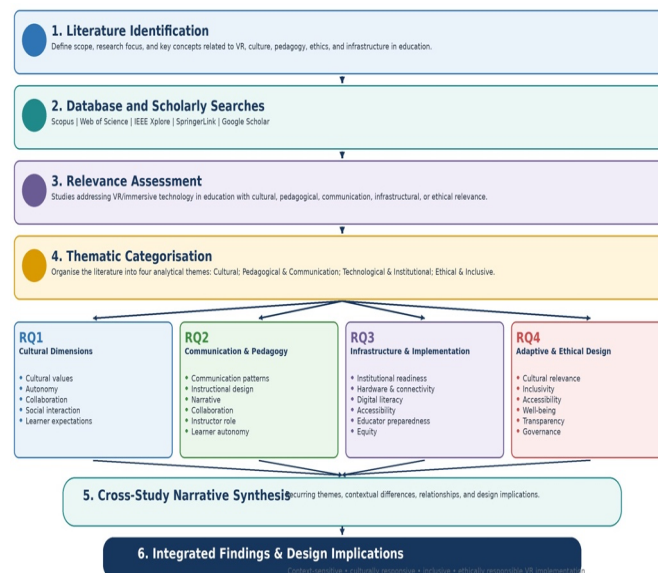


Fig. 1. Structured procedure for the narrative review and mapping of evidence to the four research questions.

The literature search was conducted across major academic databases, including Scopus, Web of Science, IEEE Xplore, Springer LinkGoogle Scholar. Peer-reviewed journal articles, conference proceedings, and authoritative book chapters published primarily between 2009 and 2024 were considered, reflecting both foundational and recent developments in VR, e-learning, and interactive multimedia. Search terms included combinations of virtual reality, education, culture, cross-cultural, pedagogy, ethics, interactive multimedia, and infrastructure. Seminal works on cultural theory [4,5] and

established VR and e-learning frameworks were also purposefully included to support theoretical grounding.

Inclusion criteria comprised studies that (a) examined VR or immersive technologies in educational contexts, (b) addressed cultural, pedagogical, or ethical factors explicitly or implicitly, and (c) provided empirical findings, and conceptual models, or critical reviews relevant to cross-cultural analysis. Studies focusing solely on technical performance without educational or contextual considerations were excluded.

Analytical Framework and Alignment with Research Questions.

To address RQ1, the reviewed studies were analysed using established cultural frameworks, particularly Hofstede's cultural dimensions and Hall's communication context theory. This enabled comparison of learner preferences, engagement patterns, and interaction styles across cultural settings.

For RQ2, attention was given to communication styles, instructional design approaches, and pedagogical traditions reported in the literature. Studies were examined for how narrative structures, collaboration models, instructor roles, and learner autonomy influenced VR interaction and learning experiences.

To address RQ3, the analysis considered institutional readiness, technological infrastructure, digital literacy, and access to VR tools. Evidence from studies conducted during and after the COVID-19 pandemic was synthesized to evaluate ethical implications related to accessibility, equity, and responsible implementation.

Finally, RQ4 was addressed through a cross-study synthesis of reported design recommendations, best practices, and ethical guidelines. Recurring principles related to cultural adaptability, inclusivity, learner well-being, and governance were identified and consolidated into overarching design and implementation considerations.

Table 1. Mapping of Research Questions to the Narrative Review Analysis

Research Question	Analytical Focus	Evidence Examined
RQ1	Cultural dimensions	Individualism–collectivism, power distance, cultural expectations, autonomy and collaboration.
RQ2	Communication and pedagogy	High/low-context communication, narrative, instructor role, learner autonomy, collaboration.
RQ3	Infrastructure and implementation	Institutional readiness, connectivity, hardware, digital literacy, accessibility.
RQ4	Inclusive and ethical design	Cultural adaptability, accessibility, well-being, transparency, governance.

2.5 Synthesis and Reporting

Findings were thematically organized according to the four research questions, enabling coherent interpretation across cultural, pedagogical, technological, and ethical dimensions. This structured synthesis ensured transparency in how evidence informed the study's conclusions and recommendations.

2.6 Methodological Rationale

A narrative review methodology was adopted to address the objectives of this study, which required an integrative and theory-driven examination of Virtual Reality use across diverse cultural, pedagogical, and ethical contexts. Unlike systematic reviews that prioritise narrowly defined research questions and homogeneous study designs, a narrative approach enables the synthesis of heterogeneous empirical, conceptual, and theoretical literature drawn from multiple disciplines and regions. This flexibility was particularly important given the cross-cultural focus of the study, where variations in educational systems, communication norms, technological infrastructures, and ethical frameworks limit the applicability of purely quantitative aggregation methods.

Furthermore, the research questions guiding this review emphasised interpretation and contextual comparison rather than effect size estimation. Examining how cultural dimensions influence VR engagement, how pedagogical traditions shape interaction, and how ethical considerations intersect with infrastructural conditions necessitated a method capable of capturing nuance, meaning, and conceptual relationships. A narrative review therefore provided an appropriate framework for identifying patterns, tensions, and design principles across culturally situated studies, while allowing established cultural theories and prior e-learning frameworks to inform analysis.

This methodological choice also aligns with established practices in educational technology research, where narrative and critical reviews are widely used to advance theory development, inform design frameworks, and guide policy and practice in emerging technological domains. As such, the narrative review approach supported the study's aim of developing culturally responsive and ethically grounded insights into VR adoption in education, rather than producing an exhaustive or statistically synthesised account of the existing literature.

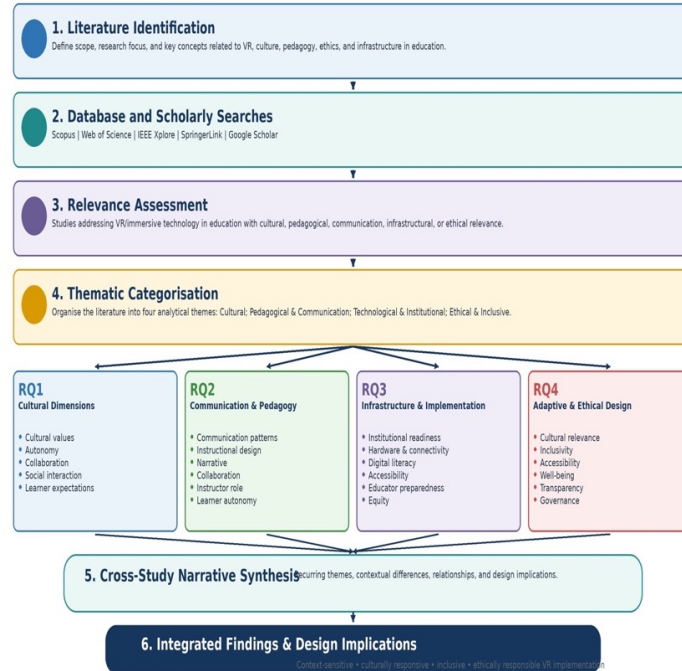


Fig. 2. Illustrates the conceptual flow of the study, showing the relationship between purpose, narrative review methodology, key findings, and implications for cross-cultural VR use.

3 Findings

3.1 RQ1: Cultural Dimensions and VR Engagement

The reviewed literature suggested that cultural values may influence how learners perceive and engage with VR-based learning environments, particularly in relation to autonomy, collaboration, social interaction, and preferred modes of participation. Cross-cultural research on VR adoption indicates that the relative importance of factors associated with users' attitudes and behavioral intentions can vary across countries and regions, rather than following a single universal model [9].

Hofstede's cultural dimensions, particularly individualism–collectivism and power distance, were considered as interpretive lenses for examining possible differences in learner expectations and interaction preferences. These mentions were not treated as deterministic predictors of individual behavior, because cultural categories do not imply that all learners within a particular country or cultural group share identical preferences [5].

Similarly, Hall's high- and low-context communication framework was used to interpret how expectations concerning explicit communication, contextual information,

narrative structures, and symbolic meaning may be relevant to immersive learning environments [4]. The synthesis therefore supports culturally responsive flexibility in VR design rather than fixed assumptions about countries or cultural groups.

3.2 RQ2: Communication Styles and Pedagogical Traditions

The reviewed literature indicated that communication styles and pedagogical traditions may influence how VR learning environments are structured, interpreted, and experienced. Hall's communication-context framework provides a theoretical basis for considering the potential relevance of explicit communication, contextual information, narrative structures, and symbolic representation when immersive learning experiences are designed for different educational contexts [4].

From a pedagogical perspective, the literature highlighted the importance of instructional structure, learner autonomy, collaboration, experiential learning, and educator involvement in shaping VR-based learning experiences. These findings are consistent with broader research on immersive learning, which indicates that the educational value of VR depends on the alignment between immersive technology and pedagogical objectives rather than on technological immersion alone [1].

The synthesis therefore does not support a single universal communication or instructional model. Instead, VR learning environments should provide sufficient flexibility to accommodate differences in communication expectations, instructional guidance, collaboration, and learner autonomy.

3.3 RQ3: Educational and Technological Infrastructure

The findings indicated that technological infrastructure, institutional readiness, and user preparedness are important conditions influencing VR adoption and implementation. Cross-cultural evidence suggests that the relative importance of adoption-related factors can differ across developed and developing contexts. Monteiro et al. for example, identified differences in the relative importance of performance expectancy, effort expectancy, social influence, facilitating conditions, self-efficacy, and other factors across different development contexts [9]. These findings reinforce the importance of considering local conditions rather than applying a single universal adoption.

Access to appropriate hardware, reliable connectivity, technical support, digital literacy, self-efficacy, educator preparedness, and institutional capacity can affect whether VR can be implemented consistently and equitably. Research on immersive VR in higher education also identifies technological, pedagogical, and implementation-related considerations that influence successful integration [1].

Previous work on digital and e-learning implementation further indicates that institutional preparedness, infrastructure, training, and resilience-oriented planning are important for sustainable technology integration [7]. Evidence from virtual education during the COVID-19 pandemic similarly highlights the challenges associated with unequal access to technological resources and institutional capacity [2].

These findings have important implications for equity. Differences in access to devices, connectivity, technical support, and digital skills may create unequal opportunities to benefit from immersive learning. Responsible implementation should therefore consider local infrastructure, educator preparedness, accessibility, and institutional capacity alongside the educational purpose of VR.

3.4 RQ4: Culturally Adaptive, Inclusive, and Responsible Design

The cross-study synthesis identified several recurring principles relevant to culturally adaptive and responsible VR design. These included cultural relevance, inclusivity, accessibility, learner autonomy, meaningful participation, learner well-being, transparency, educator preparedness, and appropriate institutional governance.

Cultural adaptability may involve consideration of local languages, symbols, narratives, communication practices, and interaction expectations. However, culturally responsive design should avoid stereotyping or if all learners within a cultural group share the same preferences. Flexible design options can instead allow learners and educators to adjust levels of collaboration, guidance, autonomy, and interaction according to educational objectives and contextual needs.

The literature also indicates that responsible VR implementation extends beyond interface design. Accessibility, educator preparation, institutional readiness, learner well-being, and responsible governance should be considered throughout the implementation process. These considerations are consistent with broader findings on the challenges of immersive VR implementation and the need to align technological capabilities with educational and contextual requirements [1,2].

Overall, the synthesis supports a flexible rather than universalised approach to VR design. Culturally responsive and ethical implementation requires consideration of cultural context alongside pedagogical purpose, accessibility, technological feasibility, institutional readiness, and learner needs.

3.5 Cultural Dimensions, Pedagogical, and Ethical Design

Clear patterns emerged across cultural dimensions. In individualistic cultures, such as the United States and the United Kingdom, participants showed a strong preference for self-directed and solo VR learning modules. From an ethical standpoint, these preferences aligned with values of autonomy and personal agency, emphasising user control over pace, navigation, and interaction. In contrast, collectivist cultures, including Japan and Nigeria, favoured collaborative VR simulations that supported shared decision-making and social presence. These findings underscore the ethical importance of designing VR environments that respect culturally embedded notions of participation and collective responsibility, rather than imposing individual-centred interaction models.

Communication context further influenced ethical engagement with VR. High-context cultures, such as China and Saudi Arabia, responded more positively to immersive experiences featuring symbolic representation, narrative depth, and indirect storytelling. Ethically, these designs supported cultural authenticity and reduced cognitive dissonance by aligning with established meaning-making practices. Conversely, users

from low-context cultures preferred transparent, goal-oriented tasks with explicit instructions, reinforcing the ethical principle of clarity and informed interaction in VR systems [4].

Power distance also shaped ethical acceptance. In high power-distance contexts, VR applications that reflected hierarchical roles, such as instructor-led or expert-guided simulations, were perceived as more legitimate and trustworthy. Egalitarian designs, while ethically aligned with participatory ideals in some cultures, were less effective in contexts where authority structures are culturally embedded. These findings highlighted the ethical necessity of contextual sensitivity rather than universalized design assumptions.

3.6 Technological, Educational, and Governance Factors

Technological infrastructure strongly influenced ethical accessibility. Regions with advanced digital ecosystems, including South Korea and Sweden, demonstrated higher VR adoption and sustained use, enabling safer deployment through stable connectivity, device quality, and institutional support. In contrast, limited infrastructure raised ethical concerns related to unequal access and exclusion. These results reinforced calls for low-bandwidth compatibility, adaptive interfaces, and inclusive deployment strategies as core ethical requirements in VR adoption [1].

Educational systems emphasizing experiential and learner-centered pedagogies, such as Finland, integrated VR more effectively and responsibly than systems relying on rote memorization. This alignment supported ethical frameworks that prioritize meaningful learning, learner well-being, and pedagogical purpose over technological novelty. Consistent with Lahwal, Alsulimani, and Amaimin (2023)[7], institutional readiness and resilience-oriented planning emerged as essential governance mechanisms for ethical and sustainable VR integration.

Overall, the findings indicated that ethical VR adoption is inherently context-dependent, requiring alignment between cultural values, infrastructural capacity, pedagogical intent, and governance structures. These results support the need for culturally adaptive and ethically grounded VR frameworks that move beyond one-size-fits-all implementations.

4 Discussion

The findings of this narrative review highlight the interrelationship between cultural, pedagogical, technological, and ethical dimensions of Virtual Reality use in education. Rather than indicating a single universal pattern of VR adoption, the synthesis suggests that the educational use of VR is shaped by the context in which the technology is introduced. Cultural expectations, pedagogical practices, infrastructural conditions, and institutional readiness may interact to influence how VR learning environments are designed, implemented, and experienced.

In relation to RQ1, cultural dimensions provide useful interpretive perspectives for examining differences in learner expectations, autonomy, collaboration, communication, and engagement. Hofstede's cultural dimensions and Hall's communication-context framework can support contextual interpretation, but they should not be treated as deterministic explanations of individual behaviour. This distinction is important because national or cultural classifications may conceal substantial variation within and across groups [5].

For RQ2, the findings indicate that communication styles and pedagogical traditions may influence interaction design, instructional guidance, collaboration, learner autonomy, and the interpretation of immersive learning experiences. The educational value of VR therefore depends not simply on the level of immersion but on the alignment between technological affordances and pedagogical objectives [1].

Regarding RQ3, technological infrastructure and institutional readiness emerged as important conditions for sustainable and equitable implementation. Access to suitable devices, connectivity, technical support, digital skills, educator preparedness, and institutional capacity can affect the feasibility and accessibility of VR-based learning. Cross-cultural evidence further suggests that adoption-related factors may vary according to local development and educational conditions [9]. These findings reinforce the need to consider equity and accessibility alongside technological innovation.

For RQ4, the synthesis identified recurring principles for culturally adaptive and responsible VR implementation, including cultural relevance, inclusivity, accessibility, learner autonomy, meaningful participation, learner well-being, educator preparedness, transparency, and institutional governance. These principles suggest that culturally responsive design should emphasise flexibility rather than fixed assumptions about particular cultural groups.

Taken together, the four research questions demonstrate that culture, pedagogy, infrastructure, and ethics should not be considered as isolated dimensions. Their interaction is particularly important when VR is introduced into educational environments with different institutional capacities, communication practices, pedagogical traditions, and technological resources. The findings therefore support a context-sensitive approach to VR adoption and implementation.

4.1 Theoretical and Practical Implications

Theoretically, this review contributes to the understanding of VR in education by bringing cultural, pedagogical, technological, and ethical considerations together within a single analytical perspective. Cultural frameworks such as those proposed by Hofstede and Hall are most appropriately used as interpretive tools that can inform contextual analysis rather than as predictive classifications of individual learners.

Practically, educators and developers should assess the cultural and educational context in which VR will be used, provide flexibility in interaction and instructional guidance, consider accessibility and infrastructure, and prepare educators and learners for effective use. Institutions should also consider governance, learner well-being, data responsibility, and equitable access when planning VR implementation.

4.2 Limitations and Future Research

This review has several limitations. First, as a narrative review, it provides an interpretive synthesis rather than a systematic statistical aggregation of evidence. The selection and interpretation of literature may therefore involve a degree of researcher judgement. Second, the use of national and cultural frameworks may risk oversimplifying intra-cultural variation if applied without contextual sensitivity. Third, VR technologies and educational practices continue to develop rapidly, meaning that some technological and implementation conditions may change over time.

Future research should complement this narrative synthesis with longitudinal, mixed-methods, and empirical cross-cultural studies. Such research could examine how cultural, pedagogical, infrastructural, and ethical factors interact over time and across different educational settings. Empirical studies involving diverse institutions and learner populations would also help validate and refine the context-sensitive design principles identified in this review.

5 Conclusion

This narrative review examined how cultural, pedagogical, technological, and ethical factors interact in shaping the adoption and use of virtual reality in education. By explicitly organising the synthesis around four research questions, the review indicates that VR adoption and educational use are context-dependent rather than universally consistent across educational settings.

In relation to RQ1, the findings indicate that cultural dimensions can provide useful interpretive perspectives for understanding differences in learner expectations, interaction, autonomy, collaboration, and communication. However, these dimensions should not be treated as deterministic predictors of individual behaviour. In relation to RQ2, communication styles and pedagogical traditions may influence how immersive learning experiences are structured and interpreted, supporting the need for flexible approaches to communication, instructional guidance, collaboration, and learner autonomy.

Regarding RQ3, technological infrastructure, institutional readiness, digital literacy, educator preparedness, and access to appropriate resources emerged as important conditions for equitable and sustainable VR implementation. These conditions also have ethical implications because unequal technological capacity may contribute to unequal access to immersive learning opportunities. Finally, RQ4 identified recurring principles for culturally adaptive and responsible VR implementation, including cultural relevance, inclusivity, accessibility, learner autonomy, meaningful participation, well-being, transparency, and appropriate institutional governance. Overall, the review supports a context-sensitive approach to VR in education rather than a one-size-fits-all model. Effective implementation requires alignment between cultural expectations, pedagogical objectives, technological capacity, institutional readiness, and ethical responsibility. The review therefore provides a conceptual basis for educators, developers, and policymakers seeking to design and implement VR learning environments that are adaptable, inclusive, and responsive to diverse educational contexts.

Future research should complement this narrative synthesis with longitudinal, mixed-methods, and empirical cross-cultural studies to examine how these factors interact over time and to validate context-sensitive approaches to VR design and implementation

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الواقع الافتراضي في التعليم عبر الثقافات

مراجعة سردية للأبعاد الثقافية والتربوية والأخلاقية

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المستخلص. تستعرض هذه المراجعة السردية الكيفية التي يسهم بها الواقع الافتراضي (VR) في إحداث تحولات في التعليم الجامعي من خلال الابتكار متعدد التخصصات والتعلم الغامر. واستنادًا إلى الأدبيات العلمية المنشورة خلال الفترة الممتدة من 2010 إلى 2025، تستكشف هذه المراجعة تطبيقات التعليم الغامر للواقع الافتراضي، وإمكاناته التعليمية، والتحديات المؤسسية المرتبطة بتوظيفه في مؤسسات التعليم العالي.

وتُبرز المراجعة قدرة الواقع الافتراضي على ربط المعرفة النظرية بالتطبيق العملي، ودعم التعلم القائم على الخبرة، وتيسير التعاون بين التخصصات في مجالات مثل الطب والهندسة والعلوم. ومع ذلك، فإن أثره التعليمي يعتمد على فاعلية التصميم التعليمي، وجاهزية أعضاء هيئة التدريس، والاستعداد المؤسسي، وإتاحة الوصول العادل إلى التقنيات.

وتشمل أبرز العوائق تكاليف التنفيذ، ومحدودية البنية التحتية، والفجوات الرقمية، والمخاوف الأخلاقية المرتبطة بالخصوصية ورفاه المتعلمين. وتؤكد المراجعة أن مجرد توفير تجربة غامرة لا يضمن، في حد ذاته، تحسين مخرجات التعلم؛ إذ يتطلب الدمج الفعال للواقع الافتراضي وجود أهداف تربوية واضحة، وتوجيه مناسب للمتعلمين، وتقييم مستمر.

كما تقترح المراجعة إطارًا مفاهيميًا يركز على سلامة الممارسات البيداغوجية، والجاهزية المؤسسية، والتصميم الأخلاقي والشامل. وتختتم المراجعة بمجموعة من التوصيات الرامية إلى تحقيق دمج مستدام للواقع الافتراضي في التعليم الجامعي، كما تحدد أولويات للبحوث المستقبلية، ولا سيما في سياقات التعلم متعدد التخصصات والسياسات التعليمية التي تعاني من محدودية التمثيل البحثي.

الكلمات الدلالية. التعلم متعدد التخصصات، التحول الرقمي، تكنولوجيا التعليم، أساليب التدريس الغامرة، الاستفادة، التعليم الجامعي، الواقع الافتراضي.