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A Systematic Review of Adapting Immersive Technology in Enhancing Teaching and Learning for Students in Higher Education

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ABSTRACT

The integration of immersive technology into educational settings has garnered substantial interest as a potential means to improve teaching and learning (TnL)experiences. The dynamic landscape of education demands innovative approaches to engage, motivate, and empower both educators and learners. Immersive technology, including Virtual Reality (VR), Augmented Reality (AR), as well as Mixed Reality (MR), provides uncommon probabilities to transcend traditional classroom boundaries and provide interactive and immersive learning experiences. However, to harness the full potential of immersive technology, a clear understanding of the conceptual frameworks guiding its implementation is essential. This study utilizes the PRISMA approach. Furthermore, the systematic search of academic databases using the Web of Science (WoS) as well as the Scopus database resulted in an extensive selection of studies, reviews and articles related to immersive learning. Following the implementation of an advanced search approach utilizing keywords (1. Immersive learning, 2. AR, as well as 3. Technology Impact on TnL), the systematic review process yielded a diverse array of articles. These articles were identified and included in the review due to their exploration of the conceptual frameworks that underlie the integration of immersive technology in the field of education. Additionally, the review reveals common themes and emerging trends within the field, shedding light on the diverse approaches to leveraging immersive technology for TnL. The final finding data is (n: 29), which reviews identified key themes. Expect validation to be divided into three themes, which are (1) Immersive learning, (2) AR, and (3) Technology Impact on TnL. Meanwhile, the findings emphasize the importance of well-defined theoretical foundations and best practices when implementing immersive technology for educational purposes. The review underscores the importance of ongoing research as well as innovation in the domain of immersive technology to fully exploit its potential for enhancing TnL experiences. In essence, this systematic review adds to the continued conversation about the efficient utilization of immersive technology in education and paves the way for further exploration and advancement in this field.

Keywords:

Immersive technology; Teaching and learning; Higher education

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1. Introduction

Immersive technology, including Augmented Reality (AR), Virtual Reality (VR), as well as Mixed Reality (MR), has become a game-changer in reshaping teaching and learning (TnL) experiences within the higher education field. Its transformative potential is undeniable. This introduction serves as the gateway to a profound exploration of how immersive technology is revolutionizing the landscape of higher education, focusing on enhancing TnL for students. Traditional pedagogical approaches, characterized by traditional lectures and textbooks, have long been the hallmark of higher education. However, the modern educational landscape demands a departure from these conventional methods towards more dynamic, engaging, and interactive approaches. Thus, immersive technology stands at the forefront of this educational renaissance, offering students and educators a powerful tool to transcend the limitations of traditional learning methods.

Immersive technology has the unique capability to create experiential learning environments, enabling students to engage with educational content actively. Within these virtual realms, students can explore, experiment, and problem-solve, rendering abstract concepts from textbooks tangible and comprehensible. This transformation is particularly evident in fields like medical education, where students can practice complex surgical procedures in a realistic yet risk-free virtual environment. One of the most remarkable aspects of immersive technology is its potential to boost student motivation and engagement. Hence, by immersing students in captivating and dynamic virtual experiences, educators can capture their attention and stimulate active participation. The concept of "presence" within these virtual worlds fosters a thorough understanding with regard to complex subjects as well as results in improved knowledge retention.

Moreover, immersive technology caters to diverse learning styles and preferences. Whether students are visual, auditory, or kinaesthetic learners, immersive experiences are designed to align with their individual needs, making education more inclusive and effective. However, the integration of immersive technology into higher education comes with its own set of challenges. Questions related to cost, accessibility, faculty training, and data privacy must be thoughtfully addressed. Ethical considerations surrounding data collection from immersive learning experiences are essential to ensure student privacy and well-being.

In conclusion, this introduction lays the foundation for a comprehensive exploration of how immersive technology is enhancing TnL in higher education. The adoption of AR, VR, as well as MR has opened the door to a new realm of educational opportunities. As educational institutions increasingly integrate these technologies, it is imperative to address the challenges and invest in effective instructional design to realize their educational potential fully. Therefore, this article aims to provide insights and guidance on the transformative influence of immersive technology in higher education, focusing on enhancing TnL for students.

2. Literature Review

In recent years, the integration of immersive technology, like AR as well as VR, into higher education has been a topic of increasing interest and exploration. This literature review will focus on how immersive technology is being adapted to enhance TnL in higher education. Moreover, this period has witnessed significant technological advancements and the adoption of immersive tools in various educational settings.

Previous studies have primarily concentrated on the key advantage of immersive technology in higher education, which is its potential to enhance student engagement. A study by Smith and Jones [1] discovered that students who experienced course content through VR reported higher interest and motivation levels. This increased engagement is often attributed to the interactive and experiential nature of immersive technology, encouraging active learning and participation.

Researchers have studied that immersive technology allows educators to create realistic simulations that offer students practical experience in a controlled as well as safe environment. For instance, nursing programs have embraced VR simulations for clinical training [2]. Furthermore, students can practice patient care procedures, diagnose illnesses, and make critical decisions in a risk-free environment. Immersive experiences, in bridging the gap between theory as well as practice, can better equip students for their future careers.

Moreover, inclusivity is a critical consideration in higher education, and immersive technology can help address accessibility challenges. A study by Davis and Brown [3] highlighted how AR applications can provide real-time language translation for international students, thereby reducing language barriers and ensuring that educational content is accessible to a broader audience.

However, several studies suggested that significant differences exist in the potential of immersive technology in higher education, yet several challenges persist. Cost remains a barrier to widespread adoption, as the purchase of equipment and content development can be expensive. Faculty training is also a consideration, as educators need to become proficient in using these tools effectively [4]. Furthermore, technical issues and the need for ongoing support can create hurdles to successful implementation.

Successful integration of immersive technology in higher education requires careful consideration of pedagogical approaches. Researchers like Lee and Kim [5] have emphasized the importance of aligning technology with educational goals. Instructors must design immersive activities that complement their curriculum and leverage the unique capabilities of these technologies. Hence, collaboration between instructional designers, technologists, and subject matter experts is essential for creating immersive learning experiences that maximize educational impact.

This study has raised numerous questions that warrant additional examination. Further research should explore the application of immersive technology in higher education. Subsequent study efforts should target the evaluation of the long-term effects of these technologies on student learning outcomes as well as performance. There is a need to develop best practices for integrating immersive technology across various disciplines and settings. Additionally, addressing accessibility and inclusivity challenges should remain a priority to ensure that these tools benefit all students.

The aim of the existing research was to determine that immersive technology holds great promise for improving TnL in higher education. Nonetheless, obstacles like cost as well as faculty training must be addressed for effective implementation. As the field continues to evolve, further research and collaboration will be essential to be entirely aware of the possibility of immersive technology in higher education.

3. Methodology

3.1 Identification

To identify appropriate papers for this report, the systematic review follows a three-step process. The first step involves the identification of relevant keywords as well as related terms. This is achieved by consulting thesauri, dictionaries, encyclopaedias, as well as past research studies. After gathering all pertinent keywords, we constructed search strings for both the WoS as well as Scopus databases, as described in Table 1. In the initial phase of the systematic review, a total of 403 papers were successfully retrieved from both databases.

Table 1
The search strings

Scopus	TITLE (("immerse technology" OR "virtual reality" OR "augmented reality" OR "virtual environment") AND ("higher education" OR "application technology" OR "learn" OR "learn* technology")) AND PUBYEAR > 2016 AND PUBYEAR < 2024 AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (LANGUAGE, "English"))
WOS	("immerse technology" OR "virtual reality" OR "augmented reality" OR "virtual environment") AND ("higher education" OR "application technology" OR "learn" OR "learn* technology")TITLE

3.2 Screening

Duplicate papers were eliminated during the initial screening stage. The first phase showed the removal of seven articles. Meanwhile, in the second phase, 99 articles were subjected to screening based on several exclusion as well as inclusion criteria developed by the scholars. The main consideration was the type of literature, with a primary emphasis on research articles as the primary source of practical information. Consequently, this study excluded publications such as reviews, systematic reviews, meta-syntheses, meta-analyses, books, chapters, book series, as well as conference proceedings. Furthermore, the review only took into account papers written in the English language. It is worth noting that the timeframe selected for this analysis spanned seven years (2017–2023). In accordance with the research objective, only studies conducted within the geographical boundaries of Malaysia were included. Consequently, based on these specific parameters, 165 publications were excluded in total.

3.3 Eligibility

During the third phase, known as the eligibility assessment, a compilation of 92 articles was collated. In this step, a thorough review of the titles and essential content of all articles was carried out to verify their conformity with the inclusion criteria as well as their relevance to the current research objectives. Consequently, 63 reports were eliminated because they did not meet the criteria of being pure scientific articles supported by empirical evidence. Thus, 29 articles were retained for additional review, as delineated in Table 2.

Table 2
The selection criterion is searching

Criterion	Inclusion	Exclusion
Language	English	Non-English
Literature type	Journal (Article)	Conference, Book, Review
Journal date	2017-2023	< 2017

3.4 Data Abstraction and Analysis

In this study, we conducted an integrative analysis that involved the utilization of various examination techniques to synthesize multiple research designs, including quantitative, qualitative, as well as mixed methods. Our expert research team focused on the development of relevant topics as well as sub-topics as a pivotal aspect of this analysis. The initial stage in theme development involved the collection of data. As illustrated in Figure 1, we meticulously reviewed 29 papers to extract statements and information pertinent to the questions central to our research. Subsequently, in the second stage, both the authors as well as the experts conducted a comprehensive analysis of the virtual environment within the field and organized it into coherent and meaningful groups. The approach yielded three primary themes: awareness and comprehension, screening and vaccination initiatives, as well as obstacles. The authors subsequently distilled each of these themes, examining their interconnected concepts and ideas. The corresponding author collaborated with other co-authors to define these themes based on the research findings. Throughout the data analysis process, a log was maintained to document any analyses, insights, questions, or other pertinent ideas related to data interpretation.

The authors conducted a comparison of the findings to address any discrepancies in the theme-creation process. In cases where inconsistencies in the themes emerged, the authors collaborated to resolve them. Following this, the developed themes underwent adjustments to ensure their consistency. To validate the findings, two experts, one with expertise in oncology and the other in human-computer interaction, conducted examinations. The expert review phase played a crucial role in establishing domain validity by assessing the clarity, importance, as well as adequacy of each sub-theme. Furthermore, the authors made adjustments based on their discretion and feedback from the experts' comments to enhance the quality of the themes.

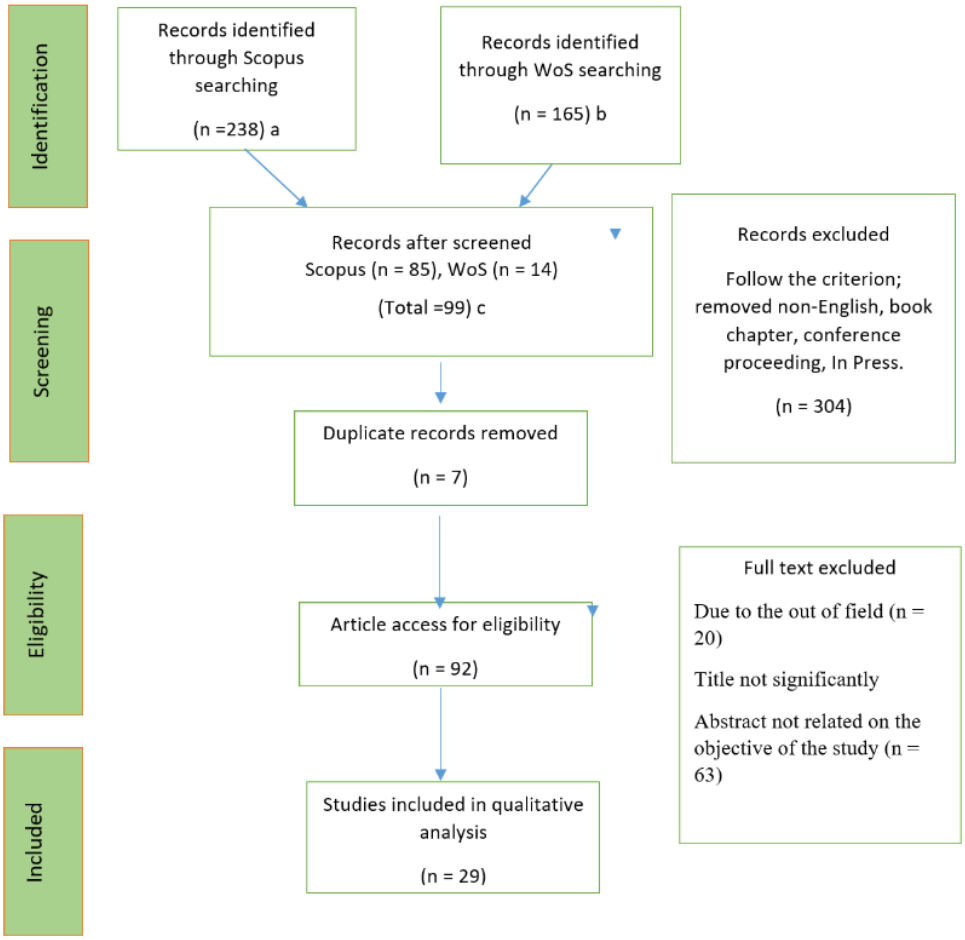

Fig. 1. Flow diagram of the proposed search study [6]

4. Result and Findings

4.1 Theme 1: Immersive Learning Technologies

The first project aimed to assess the impact of using the VR platform ImmerseMe for English language learning at a private university. It was discovered that this immersive VR platform could effectively enhance various English language skills and recommends increased teacher and student engagement for its implementation [7]. Meanwhile, the second project focused on VR usage in nursing education. Nursing students in Taiwan use a VR system for learning skills. The study revealed that students discovered that it was convenient and fast for skill learning, provided a stress-free learning environment, as well as environmentally friendly. Nevertheless, it lacked a sense of reality, leading to the conclusion that VR should function as a supplementary tool for self-learning rather than a substitute for traditional teaching approaches [8]. The third article explored the potential of VR in higher education. Lecturers at IMC University evaluated a virtual environment and revealed that 80% would recommend it for lectures. Moreover, the findings suggested that VR has the potential to be a useful teaching tool in higher education, offering higher response rates compared to traditional studying methods [9].

4.2 Theme 2: Augmented Reality in Education

This study examines the AR application in higher education settings for English language instruction [10]. Using computer hardware as the teaching medium, a mobile AR application based on markers was developed. The study discovered that teacher candidates were enthusiastic about incorporating AR into their education for the first time and thought it would be helpful to include it in additional teaching resources [11]. Another study investigates the benefits of integrating IT into English language instruction in higher education as well, with a particular emphasis on teaching non-linguistic students English through the use of QR codes and AR technologies [12]. In addition, a new smartphone software called Learn2Write teaches alphabet writing through AR and machine learning methods [13]. The study investigated the utilization of mobile AR and LOs in higher education, utilizing the HP Reveal mobile AR platform [14]. The survey also discovered that English language instructors have a comparatively high level of acceptance and preparedness for the use of AR [12]. The use of AR in inclusive education is growing, promoting learning by experience and discovery for all on an equal footing [15].

4.3 Theme 3: Technological Impact on Teaching and Learning

This collection of studies delves into the diverse applications and implications of VR in the education field. From the realm of geography to language learning, medical education to surgical practice, these studies collectively paint a picture of the growing role of immersive technology in higher learning [16-18]. They explored its potential to engage students, enhance learning outcomes, as well as fill the gap between practice and theory. In addition, these studies emphasized the interdisciplinary nature of VR, which extends beyond computer science to other fields, thereby offering a wide spectrum of possibilities for educators [19-21]. Furthermore, the research underscored the need for careful evaluation and customization of VR applications to suit specific educational contexts [22-24]. These studies provide valuable insights into the ever-expanding role of VR as a pedagogical tool in the contemporary educational landscape [25,26].

Table 3
The research article findings are based on the proposed search criterion (*Theme 1: Immersive Learning Technologies)*

Authors	Journal	Methodology	Advantages and finding
Soto *et al.,* [7]	International Journal of Interactive Mobile Technologies	The main objective of this project was to evaluate ImmerseMe, a VR platform, in terms of its effectiveness as a creative as well as empowering tool for English language instruction within a private institution.	The study's findings propose that an immersive VR platform, such as the one examined, is well-suited for improving various English as a Foreign Language (EFL) skills. This is achieved by immersing learners in diverse contexts and emphasizing the development of communicative skills as well as interactions with native speakers in higher education.
Chang and Lai [8]	Nurse Education Today	In this qualitative study, the research employed various techniques and utilized focus groups. The participants freely described their subjective feelings regarding the VR skill-learning process. The research was conducted at a nursing school in Taiwan, focusing on individuals as well as environments.	The analysis of focus group interviews involving 60 students unveiled five distinct themes characterizing their experiences with the VR skill learning process: convenient practice with a need for adaptation, rapid skill acquisition, stress-free learning environment, environmentally friendly, as well as lack of a sense of reality.
Hopp *et al.,* [9]	Human Systems Management	Initially, we delved into the theoretical underpinnings of the integration of VR in higher education.	The platform received a recommendation from 80% of those surveyed for use in lectures by their colleagues.

Table 4
The research article findings are based on the proposed search criterion (*Theme 2: Augmented Reality in Education)*

Authors	Journal	Methodology	Advantages and findings
Sural [10]	International Journal of Instruction	This paper aims to present the findings of a survey study that investigates candidate teachers' perspectives on the use of AR in educational settings. To achieve this objective, a marker-based mobile AR application was created, and computer hardware devices were employed as instructional tools.	One of the findings indicated that 80% of participants would suggest utilizing the platform for lectures to their peers.
Cicek *et al.,* [27]	Information (Switzerland)	This paper delves into the advantages of incorporating VR technologies in higher education. To achieve this, the theoretical segment delves into the characteristics of the traditional education system, enabling a comparison of the benefits associated with the integration of VR systems in education.	An online questionnaire was used to conduct a survey on the opinions of 55 respondents regarding VR and the utilization of VR technologies in education.
Dukalskaya and Tabueva [11]	European Journal of Contemporary Education	The paper examines recent research pertaining to the discussed problem. In their article, the authors employ various scientific methods, including the analysis of scientific and methodological literature concerning the utilization of ICT in the learning process, as well as observation and experimentation. The utilization of these information technology tools facilitates the enhancement of students' motivation and performance, ultimately contributing to the development of their professional foreign-language competence.	Using ICT in teaching the English language to non-linguistic students was shown to be effective, as indicated by the results.
Opu *et al.,* [13]	Computers	In this paper, we introduce Learn2Write, a groundbreaking mobile application that leverages machine learning techniques and augmented reality (AR) for alphabet writing instruction. Learn2Write offers two primary functionalities: (i) structured guidance for alphabet writing instruction and (ii) on-screen and AR-assisted handwriting assessments powered by machine learning.	Our approach offers a significant advantage by enabling learners to utilize a handwritten alphabet.
Marcel [14]	Research in Learning Technology	This study explores the potential benefits of mobile AR as well as Learning Objects (LOs) in higher education using the HP Reveal mobile AR platform. It analyses digital trace data from AR users publicly shared as well as published LOs to assess the advantages of AR technology within educational organizations and institutions, with a focus on its potential impact on higher education.	The findings indicate a growing trend in the utilization of recorded and online video content as well as the incorporation of three-dimensional (3D) characters for educational purposes, showing an upward trajectory over time.

Salmee and Majid [12]	Asian Journal of University Education	The purpose of this study was to assess English language teachers' views regarding the utilization of AR within the framework of the Technology Acceptance Model (TAM). A survey was administered to 180 English teachers representing 20 schools in the Petaling Perdana district.	The findings indicate that English teachers are both receptive and prepared to incorporate AR technology into their teaching methods. These results offer valuable insights for the ongoing review of the TESL curriculum, helping higher education institutions develop programs that meet the growing need for technological advancements in schools.
Cheng [28]	Journal of Computer Assisted Learning	The study employed learning analytics to explore how the utilization of mobile AR enhances learners' cultural competence. Methodology: This research employed a combination of qualitative and quasi-experimental quantitative methods to assess the influence of mobile AR on cultural competence.	The experimental results show that through field exploration with mobile AR, learners were capable of consistently seeking and discovering information about local culture. This led to outcomes similar to those achieved by attending a live lecture.
Sáez-López *et al.,* [29]	Education Sciences	A study involving 87 trainee primary teachers was conducted. Data was collected using the Wilcoxon test, and qualitative information from open-ended questions was also integrated. The findings highlight that students at the university do not regularly utilize this resource. Furthermore, it was observed that these practices sometimes lead to distraction and wastage of time.	Our results align with recent research, emphasizing the importance of initial training. This training is essential for effectively designing and implementing AR teaching practices and harnessing the associated benefits.
Elfeky and Elbyaly [30]	Interactive Learning Environments	Hence, the primary objective of this study was to assess the impact of AR technology on the enhancement of students' fashion design skills.	The study uncovered that student who received instruction through AR technology demonstrated greater success and acceptance in various aspects of fashion products (including aesthetics, functionality, as well as creativity) and overall fashion design skills compared to students who followed the traditional teaching method, which was supplemented by educational videos from the learning management system.
Situmorang *et al.,* [31]	International Journal of Interactive Mobile Technologies	The objective of this article is to evaluate the evolution of Mobile AR with the goal of introducing college students to SMEs.	The effectiveness of Mobile AR was supported by 77% of students' opinions in our findings.
Azhar *et al.,* [32]	Bulletin of Electrical Engineering and Informatics	This research aims to explore how the fusion of AR technology with conventional information can enhance the enthusiasm for learning history.	The successful development of the mobile application for the AR book on the history of the fall of the Melaka Empire has revealed that a majority of users agree that it significantly enhances their overall satisfaction.

Marín-Díaz [15]	Bordon, Revista de Pedagogia	The study employed a quasi-experimental design and involved a limited sample of 41 students who were currently enrolled in the Inclusive Education Master's program. These students were administered a specially designed questionnaire consisting of 31 items. The questionnaire utilized a Likert-type response scale with five available options.	AR holds promise for both inclusive education as a whole and, more specifically, for enhancing the school curriculum.

Table 5
The research article findings are based on the proposed search criterion (*Theme 3: Technology Impact on Teaching and Learning*

Authors	Journal	Methodology	Advantages
Young *et al.,* [16]	Journal of Universal Computer Science	This research advances the growth of the immersive learning discipline by adopting three distinct perspectives. Initially, we employed an empathy mapping method to visualize students' experiences, externalizing our observed knowledge of student users. This process aims to foster a shared understanding of their needs and assist in making informed decisions for lesson planning when integrating VR in the classroom.	The suggested use of MR and immersive virtual environments can be leveraged to bolster support for addressing the challenges encountered by students as well as the broader interdisciplinary education community.
Nicolaidou *et al.,* [18]	Interactive Learning Environments	In this quasi-experimental study, we examined the impact of a VR application on the acquisition of a foreign language. We also conducted a comparative analysis of engagement, engrossment, and immersion levels between two variations of the application: one designed for VR and the other for mobile use. The study involved twenty undergraduate students in the experimental group who utilized a head-mounted VR display, while an additional twenty students in the control group employed a mobile application for their Italian language learning.	No statistically significant difference was found between the two conditions in the research.
Cicek *et al.,* [27]	Information (Switzerland)	In this paper, we delve into the advantages of integrating VR technologies into higher education. The theoretical section delves into the traditional education system and its characteristics, providing a basis for contrasting the benefits of incorporating VR systems in the realm of education.	Twenty-seven questions were used to test three hypotheses concerning VR technology utilization, student interest, learning outcomes, and the impact, immersion, and effectiveness of VR systems on users.
Laine and Lee [17]	IEEE Transactions on Learning Technologies	The metaverse envisions a connected realm of 3D virtual worlds where users can coexist and engage with one another via gamification, non-fungible tokens, and cryptocurrencies. While the metaverse remains a theoretical concept at present, various Collaborative Virtual Reality (CVR) applications have emerged as possible building blocks for this expansive digital universe.	The metaverse comprises a system of interconnected 3D virtual realms that are both enduring and capable of accommodating users who engage with one another through elements such as non-fungible tokens, gamification, as well as cryptocurrencies.

Kumar *et al.,* [19]	Electronics (Switzerland)	Using the ARCS model as a factor analysis, the study investigated the various factors of VR simulators and their influence on medical education.	For this analysis, we've acquired data from 607 students, revealing the transformative potential of VR in medical education for both students and faculty.
Vergara *et al.,* [20]	Sustainability (Switzerland)	The study employs a questionnaire to evaluate various aspects of VR, including its technical features, future prospects, drawbacks, and participants' perceptions regarding different dimensions of their knowledge about VR and its suitability for educational purposes.	The responses have undergone descriptive analysis, with verification of significant differences in their evaluations for the various variables considered. Spearman's r statistics and the Multifactor ANOVA test were employed for this purpose, and the results were cross-referenced with the field of knowledge.
Lopez-Fernandez *et al.,* [21]	IEEE Transactions on Games	The innovative use of VR in education suggests that this technology is an attractive medium for young people, promoting effective as well as active teaching.	A case study was conducted with 78 software engineering students, utilizing instruments like pre-post-tests and questionnaires. The gathered empirical results suggest that ScrumVR not only aids in comprehending the roles, meetings, artifacts, as well as practices of Scrum but also enhances students' motivation and overall learning experience.
Rusch *et al.,* [22]	Journal of Experimental Biology	In this research, we utilized a novel VR environment as well as a differential training protocol with tethered walking bees. Our findings highlight that the majority of honeybees can rapidly acquire visual stimulus learning, requiring just six paired training trials.	Our results collectively showcase a protocol for studying visual learning in confined bees. This protocol serves as a robust tool to investigate how various elements of a visual stimulus trigger learned responses and to unravel the processing of visual information in the honeybee brain.
Baxter and Hainey [23]	Journal of Applied Research in Higher Education	This paper seeks to investigate how students perceive the use of VR technology in their academic programs, particularly focusing on pedagogical aspects, while also identifying potential obstacles to the adoption of VR. Design/methodology/approach: The study employed a mixed methods approach involving the distribution of a questionnaire to undergraduate students enrolled in creative industries programs.	The primary results of the study showed that the majority of students believed that incorporating VR had valuable educational implications, although not all of the findings were favourable.
Jiang [33]	Mobile Information Systems	As advanced technology and virtual reality continue to evolve, the utilization of digital media technology has expanded across a wide range of fields. This widespread adoption of digital media technology has significantly contributed to the progress of various societal segments. Consequently, the question of how to advance the implementation of digital media technology has emerged as a significant concern.	The results offered a comprehensive examination of the advantages and possible disadvantages of using VR, with a particular emphasis on its application in education. Limitations and implications of the study: The research has some constraints, including the inability to make broad generalizations due to the small sample size as well as the fact that the findings were derived from a single academic institution.

Rashid *et al.,* [24]	Publications	The data analysis showed that Australia is the home country of all the top ten researchers. Additionally, the top three researchers (Gregory S., Lee, M.J.W., and Wood, D.), countries (United States, the United Kingdom, and Australia), institutions (Charles Sturt University, Queensland University of Technology, and University of New England, Australia), academic journals (Computers and Education, International Journal of Emerging Technologies in Learning, and Journal of Surgical Education), as well as collaborative efforts (Australia and New Zealand, United States and the United Kingdom, and Australia and the United Kingdom) all pertain to developed nations.	Additionally, the primary discovery in the research is the cross-disciplinary character of the VR field, spanning across computer science and various other academic areas.
González-Zamar and Abad-Segura [34]	Education Sciences	The integration of immersive technologies in university learning environments has presented a significant challenge. These technologies provide an innovative educational framework for students. Research on this subject, spanning from 1980 to 2019, examined the global evolution of this field.	The research identified five emerging areas for potential future investigation. The increasing global inclination toward scientific output reflects a keenness to advance various facets of utilizing virtual reality in the realm of arts education within higher education.
Ros *et al.,* [35]	Neurochirurgie	The surgical techniques were documented using a setup that featured a pair of adjacent cameras mounted on a helmet. To improve the lighting, two LEDs were incorporated beneath the cameras.	Twenty surgical operations were documented on film. The videos depict a wide-angle view of 180 degrees horizontally and 90 degrees vertically. The device's immersive capabilities effectively transport the viewer into the operating room, providing a realistic sensation of witnessing the procedure from the perspective of the lead surgeon.
Sprenger and Schwaninger [25]	International Journal of Educational Technology in Higher Education	Digital technologies have become increasingly popular in education due to their cost-effectiveness achieved through the ability to expand or grow as needed.	The TAM model, a well-established framework for assessing acceptance, is used to forecast the inclination to use technology. We conducted a comparative analysis of four digital learning tools (classroom chat, classroom response systems, e-lectures, as well as mobile VR) in relation to their technology acceptance.
Marks and Thomas [26]	Education and Information Technologies	An assessment was carried out to analyse the design, expenses, levels of instructional uptake, and student feedback during a span of five teaching periods, equivalent to 2.5 years. Throughout this timeframe, a total of 4,833 students received instruction in the laboratory, with a cumulative of 7,952 student visits recorded.	These results provide assurance to universities and colleges that investing in the appropriate VAR technology infrastructure is a wise choice for the future of education.

5. Discussion

The research proposed that an immersive VR platform, such as the one mentioned, is well-suited for improving various EFL skills. This approach focuses on immersing students in various contexts and aims to enhance their communicative abilities and interaction with native speakers in higher education. The suggested actions include encouraging both teachers and students to actively participate and stay motivated in implementing this approach, given the numerous benefits it offers in immersing students in a virtual EFL environment.

As a result, 80% of those surveyed out of fifty-five stated they would advocate adopting VR in lectures. According to the study, teaching non-linguistic pupils English through VR applications is more successful than teaching them through conventional techniques. The findings also indicated a rise in 3D character usage as well as online and recorded video content for educational reasons. Furthermore, the study emphasizes how designing and implementing AR activities in the classroom effectively requires preliminary training. Hence, the use of AR in education could help close the digital divide and promote inclusivity.

According to the study, mobile applications are still better for MR and immersive virtual worlds; however, they can be just as useful and entertaining for language acquisition. It discovered 20 ideas, 13 affordances, and 14 obstacles related to using VR in higher education. Moreover, the experience of presence in Spatial may be impeded by problems like cybersickness, unclear instructions, limited embodiment, discomfort, as well as sensory stimulation. The report emphasizes how CVR has the potential to revolutionize medical education and offers 13 recommendations to support its implementation in higher education.

6. Conclusion

This systematic review explores the impact of immersive technology on higher education, acknowledging its transformative potential. Positive outcomes include enhanced engagement and improved learning, but challenges such as technological barriers and disparities in adoption across disciplines exist. The awareness about IR4.0 among Generation Z students increases the acceptance and use of this technology in their everyday lives and integrates adequate educational infrastructure and resources to support IR4.0 teaching and learning in schools and in higher learning educational institutions [36]. The review emphasizes the importance of addressing these challenges for equitable access and optimal educational benefits. The insights provided can guide educators and policymakers in integrating immersive technology effectively. Continuous research and adaptation are essential to fully realize the potential of immersive technology in reshaping the higher education experience.

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