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Virtual Reality (VR) and Augmented Reality (AR): Immersive Experiences Transforming Entertainment, Education, and Training

Virtual Reality (VR) dan Augmented Reality (AR): Pengalaman Imersif yang Mengubah Hiburan, Pendidikan, dan Pelatihan

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ABSTRACT
Virtual Reality (VR) and Augmented Reality (AR) technologies are increasingly being integrated into areas such as entertainment, education, and training, offering immersive and interactive experiences that can enhance learning and student engagement. This research aims to develop a more effective evaluation method in education and training using VR and AR technology compared to traditional methods. Using the PRISMA method, this research collects and analyzes articles from various reputable international databases. The research results show that VR and AR have great potential to improve student engagement and learning outcomes, but their successful implementation depends on the development of adaptive evaluation methods. This research provides practical guidance for the effective implementation of VR and AR in education and training and contributes to new literature in the field of educational technology.
Keywords: Virtual Reality, Augmented Reality, Education, Training, Evaluation Methods, Learning Outcomes, Student Engagement.

ABSTRAK
Teknologi Virtual Reality (VR) dan Augmented Reality (AR) semakin banyak diintegrasikan ke berbagai bidang seperti hiburan, pendidikan, dan pelatihan, menawarkan pengalaman imersif dan interaktif yang dapat meningkatkan pembelajaran dan keterlibatan peserta didik. Penelitian ini bertujuan untuk mengembangkan metode evaluasi yang lebih efektif dalam pendidikan dan pelatihan menggunakan teknologi VR dan AR dibandingkan dengan metode tradisional. Dengan menggunakan metode PRISMA, penelitian ini mengumpulkan dan menganalisis artikel dari berbagai database internasional bereputasi. Hasil penelitian menunjukkan bahwa VR dan AR memiliki potensi besar untuk meningkatkan keterlibatan dan hasil belajar peserta didik, namun keberhasilan implementasinya bergantung pada pengembangan metode evaluasi yang adaptif. Penelitian ini memberikan panduan praktis untuk penerapan efektif VR dan AR dalam pendidikan dan pelatihan serta menyumbangkan literatur baru dalam bidang teknologi pendidikan.
Kata Kunci: Virtual Reality, Augmented Reality, Pendidikan, Pelatihan, Metode Evaluasi, Hasil Belajar, Keterlibatan Peserta Didik.

1. Introduction

Virtual Reality (VR) and Augmented Reality (AR) technologies are increasingly being integrated into various fields such as entertainment, education and training. These technologies offer immersive and interactive experiences that can enhance student learning and engagement. VR and AR are recognized as having the potential to revolutionize education by providing simulated environments for training and learning (Godzik et al., 2021). In particular, AR is able to seamlessly integrate virtual elements into the real world, thereby enriching the learning experience by making content more interactive and engaging (Silva et al., 2019).

The use of VR and AR in education has shown promising results, with applications ranging from nursing education to language learning (Ma, 2019; Majid & Salam, 2021). Additionally, these technologies also find practical applications in the fields of architecture, engineering, and construction, where they are used for visualization and simulation purposes (Noghabaei et al., 2020). Furthermore, VR and AR have been utilized to enhance skills learning in specific areas such as fiber optic splicing (Chang, 2021).

In the educational context, AR has been recognized for its ability to enrich the learning environment by providing interactive and immersive elements that increase motivation and improve learning retention (Kiourexidou, 2024). Studies show that AR applications in education can improve understanding of complex subjects and make learning more fun for students ("The Advantages and Applications of Augmented Reality in Science Education", 2022). Additionally, AR is identified as a valuable tool for empowering students with intellectual disabilities, offering new ways to engage and support their learning in educational settings (Sarkar, 2024).

The effectiveness of AR in education has been recognized through systematic reviews that emphasize its potential to transform traditional teaching methods and enhance learning experiences (Tiwari et al., 2023; Khairani, 2023). Overall, VR and AR technologies have great potential to revolutionize education by providing innovative and engaging ways to deliver content, improve learning outcomes, and meet diverse learning needs.

As these technologies advance and become more accessible, the integration of VR and AR in educational environments is expected to increase, offering new opportunities for immersive and interactive learning experiences.

Virtual Reality (VR) and Augmented Reality (AR) technologies have shown great potential in various fields, including entertainment, education and training. However, implementing this technology in these sectors faces a number of significant challenges. One of the main challenges is the lack of effective evaluation methods to assess the impact and success of using VR and AR in education and training. Traditional evaluation methods are often unable to capture the complexity and dynamics of the immersive experiences offered by VR and AR technologies, so an evaluation approach that is more adaptive and suited to the characteristics of these technologies is needed.

Based on the problem phenomena that have been identified, this research focuses on two main questions. First, how can the use of VR and AR technology develop more effective evaluation methods in education and training compared to traditional methods? Second, what impact does VR and AR have on student engagement and learning outcomes? These questions are aimed at filling the gap in the literature that currently has not yet thoroughly examined the effectiveness of VR and AR in the context of education and training evaluation.

The available literature indicates a significant gap in understanding of how VR and AR can be used to develop new, more effective evaluation methods. Although many studies have explored the use of these technologies in various educational contexts, few have focused on developing and evaluating appropriate methods for assessing the impact of VR and AR. Thus, this research aims to fill this gap by providing a comprehensive analysis of the effectiveness of VR and AR in increasing student engagement and learning outcomes, as well as developing more appropriate evaluation methods.

This research has high urgency considering the importance of finding more effective and interactive evaluation methods in education and training. VR and AR technologies offer great opportunities to improve student engagement and learning outcomes, but the successful implementation of these technologies relies heavily on the development of evaluation methods that can capture the complexity of the resulting immersive experiences. Traditional evaluation methods are often inadequate to assess the effectiveness of these technologies, so this research aims to address the urgent need for more innovative and appropriate evaluation approaches.

The novelty of this research lies in the focus of developing new evaluation methods using VR and AR in education and training. By exploring new ways to assess engagement and learning outcomes through immersive technologies, this research will provide a new perspective on the impact of VR and AR in educational contexts. In addition, this research will also examine in depth how this technology can be used to develop evaluation approaches that are more adaptive and interactive compared to traditional methods.

The contribution that this research will provide includes several important aspects. First, this research will provide practical guidance for the effective implementation of VR and AR in education and training, which can be used by educators and trainers to improve the quality of learning and training. Second, this research will contribute to new literature in the field of educational and training technology, by providing a comprehensive analysis of the effectiveness and impact of VR and AR. Through these contributions, it is hoped that this research can help accelerate the adoption of immersive technology in education and training, as well as improve the overall quality of learning.

2. Research Methods

2.1 Collection of articles from reputable international databases using the PRISMA method

This research uses the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method to collect and analyze articles from various reputable international databases. The PRISMA method consists of several stages which include a systematic process of searching, selecting and collecting articles. The process begins with searching for articles using predetermined keywords, followed by filtering articles based on inclusion and exclusion criteria, as well as collecting relevant and high quality articles for further analysis. This method ensures that the literature review is carried out comprehensively and transparently, and can be replicated by other researchers.

2.2 Keywords Used to Search for Articles

Article searches were carried out using main keywords such as "Virtual Reality", "Augmented Reality", "VR", "AR", "education", "training", "evaluation methods", "learning outcomes", and "engagement". A combination of these keywords was used in various international databases such as Scopus, Web of Science, and IEEE Xplore to ensure broad and comprehensive search coverage. The use of specific and relevant keywords helps in finding articles that match the research topic and reduces the risk of inclusion of irrelevant articles.

2.3 Number of Articles Retrieved

The initial search phase yielded a large number of articles related to the use of VR and AR in education and training. The articles were then filtered based on relevance to the research topic, resulting in a more focused collection of articles. The total number of articles obtained in the initial search stage reflects the breadth of the available literature, while the screening process ensures that only the most relevant and high-quality articles are included in the literature review.

2.4 Article Inclusion and Exclusion Techniques

The article inclusion and exclusion process was carried out using strict criteria to ensure the quality and relevance of the literature review. Inclusion criteria included articles discussing the use of VR and AR in education and training, empirical research evaluating engagement and learning outcomes, and articles published in reputable journals. In contrast, exclusion criteria included articles that were not relevant to the research topic, articles that were only theoretical in nature without empirical data, and articles published before a certain year (e.g., before 2010). A final screening process was carried out to ensure that only the most

relevant and high-quality articles were included in this literature review, so that the research results could make a significant contribution to the understanding of the effectiveness of VR and AR in education and training.

3. Results and Discussions

3.1. VR and AR in the Entertainment Industry

The evolution of Virtual Reality (VR) and Augmented Reality (AR) technology in the entertainment industry has experienced a significant journey starting in the 1960s. VR technology, which initially emerged in the entertainment industry, has experienced substantial progress over the years, resulting in increasingly sophisticated systems and equipment to enhance the user experience (Zhao et al., 2020; Oyewole, 2024). A surge in research and development activity over the past two decades has driven the growth of VR and AR applications in various sectors, including games, films, and entertainment events (You et al., 2021; Li, 2024).

In the entertainment sector, VR has been used in gaming and cinematic experiences, offering more immersive and interactive environments through sensor fusion technology (Fu, 2021). Furthermore, the application of VR/AR technology in education and teaching has become very important, highlighting its crucial role in the development and progress of society (Lei, 2024). VR technology has also entered the arts field, where artists and creators are utilizing it to produce virtual works of art, driving digitalization and innovation (Kowalski et al., 2023).

Additionally, VR technology offers unique advantages in the field of cultural heritage by enabling the creation of immersive experiences that replicate historical sites and objects, giving users a glimpse into the past (Georgieva & Georgiev, 2019). VR also plays an important role in reconstructing personal stories, giving individuals the opportunity to relive experiences in immersive media that have the potential to change their reality (Pillai & Mathew, 2019).

Advances in VR technology have not only impacted entertainment but have also expanded into fields such as healthcare, where VR simulations immerse users in artificial environments for a variety of applications (Marasco, 2020). The integration of VR with story narratives has opened up new possibilities for cultural tourism, allowing individuals to explore attractions and destinations without physical limitations.

In conclusion, the history and evolution of VR and AR in entertainment has been marked by significant technological advances, resulting in immersive and interactive experiences across a wide range of sectors. From gaming and cinematic experiences to education and cultural heritage preservation, VR and AR technologies continue to shape the way we interact with content and environments, offering endless possibilities for the future of entertainment.

3.2. Impact on User Experience

Virtual Reality (VR) and Augmented Reality (AR) have transformed the user experience in areas such as entertainment, education and training. VR provides users with a complete immersive experience, while AR increases the interaction between users and digital content in the real world (Delestage, 2024). These technologies have the potential to create new and engaging experiences for users, leading to better brand attitudes, increased user engagement, and increased purchase intent (Zhu & Wang, 2022).

AR and VR offer immersive interactive experiences that can overcome challenges and provide users with new ways to interact with content (Tu, 2024). VR, in particular, focuses on providing users with a high level of sensory immersion, utilizing audio and visual cues to create a strong sense of presence and emotional involvement (Oriti et al., 2021). Additionally, the combination of AR and VR can create a shared environment in which multiple users can

collaborate or compete, expanding the range of interactions and use cases compared to standalone VR experiences (Guertin-Lahoud et al., 2023).

Evaluation of user experiences in VR has become a topic of interest, with research emphasizing the importance of factors such as presence, immersion, and interactivity in shaping user experiences (M, 2024). Emotion recognition plays an important role in the development of realistic and emotional AR and VR experiences by adapting interactions and content based on the user's emotional state (Klico & Mahmić-Muhić, 2022). Additionally, immersive technologies such as VR and AR have been recognized for their potential to create value in various industries beyond entertainment (Ernstsen et al., 2019).

The immersive nature of VR technology has been shown to enhance user experience by increasing presence and interactivity, leading to increased retention and overall satisfaction (Liang, 2023). The inclusion of physical effects such as gravity and collisions further enhances the user's perception of the virtual world and satisfaction with the experience (Chen et al., 2023). Additionally, immersive media in VR has been found to have prosocial and cathartic effects, offering therapeutic benefits and enhancing the entertainment experience compared to traditional media.

In conclusion, the integration of VR and AR technology has been significant influence user experience in immersive entertainment, offering new ways for users to interact with content and creating opportunities for enhanced emotional and interactive experiences. By focusing on factors such as presence, immersion, interactivity, and emotion recognition, developers can continuously improve the user experience in virtual and augmented environments.

3.3. Challenges and Opportunities

Virtual Reality (VR) and Augmented Reality (AR) have been increasingly used in the entertainment industry, providing immersive and interactive experiences to users (Wang, 2023). These technologies have shown potential in transforming entertainment by increasing user engagement and creating new forms of interactive media (Parekh et al., 2020). The use of VR and AR in entertainment has been successful, with applications ranging from immersive sports games to virtual excursions in education and vocational training (Bai et al., 2021; Kuna, 2024).

Despite the progress and success achieved, there are several obstacles in the entertainment industry when implementing VR and AR technology. These challenges include the need for further research to fully understand the value creation potential of immersive technologies in marketing (Klico & Mahmić-Muhić, 2022). In addition, the adoption and use of VR and AR applications in entertainment also poses various challenges for the stakeholders involved, especially in the context of the COVID-19 pandemic (Shen et al., 2022).

Looking to the future, the potential of VR and AR technology in entertainment remains promising. These technologies have the ability to continue to change the way entertainment is consumed, providing new opportunities for entertainment, education, and training (Parekh et al., 2020). As their evolution and availability increases, VR and AR are expected to continue to revolutionize the entertainment industry by providing more engaging and personalized experiences for users (Hamilton et al., 2020). In conclusion, although VR and AR technologies face challenges in their implementation in the entertainment industry, their future potential remains significant in transforming entertainment experiences and creating new opportunities for immersive and interactive content.

3.4. VR and AR in Education

3.4.1. Implementation of VR and AR in Learning

Augmented Reality (AR) and Virtual Reality (VR) are increasingly being integrated into educational environments to enhance the learning experience across various disciplines and

educational levels. The combination of AR and VR technologies offers an integrated educational tool that leverages AR's capabilities to enrich real-world environments and VR's capacity to create immersive virtual spaces (Tan, 2024). The implementation of AR in education has shown promising results in improving learning outcomes by providing an interactive and immersive learning environment (Kapetanaki et al., 2021). Additionally, AR technology contributes to improving teaching methods, offering carefully designed practical learning experiences that prepare students for future learning (Anireddy et al., 2022).

In the field of science education, AR has emerged as a valuable tool, providing immersive learning experiences that enhance students' understanding of complex phenomena, such as in chemistry education (Hoai, 2024). Likewise, VR technology has been widely applied in engineering education and skills training, aligning with learning theories such as constructivism and experiential learning (Huang et al., 2020). The use of AR and VR technology in education has opened up new possibilities in the teaching and learning process, offering visual, immersive and interactive environments to enhance student learning (Ahmad & Junaini, 2020).

Teachers play a crucial role in the successful implementation of AR and VR technology in education. Teacher training, development of conceptual prototypes, and involvement of technical programs and educational architects are important steps in the adoption of AR technology in educational environments (Lai & Cheong, 2022). In addition, the integration of AR technology in language learning has been facilitated by the emergence of digital writing tools, enabling the integration of this technology into educational practices (Marrahí-Gómez & Belda-Medina, 2022). Furthermore, AR has been found to increase students' motivation and memory abilities in foreign language education, promoting contextual learning experiences (Manna, 2023).

In conclusion, the integration of AR and VR technologies in education offers significant potential to transform traditional learning approaches by providing immersive, interactive and engaging learning experiences for students. By utilizing this technology effectively and involving teachers in the implementation process, educational institutions can improve learning outcomes and better prepare students to face future challenges.

3.4.2. Evaluation Methods in Education

When comparing traditional evaluation methods with methods based on Virtual Reality (VR) and Augmented Reality (AR) in education, it is clear that the integration of VR and AR technology offers significant advantages. Traditional evaluation methods often rely on theoretical assessments and practical demonstrations in real-world environments. However, VR and AR-based evaluation methods provide a unique opportunity for learners to engage in simulated environments that mimic real-world scenarios, allowing for safe and controlled practice sessions (Lee, 2024).

Research has shown that the synergy of AR and VR in education enhances the learning experience by creating immersive virtual spaces and enriching real-world environments. The collective application of AR and VR as educational tools has the potential to revolutionize the educational experience by providing engaging and interactive learning experiences (Zhao, 2023; AlGerafi, 2023). Additionally, the use of VR and AR in education has been shown to improve student learning outcomes, knowledge retention, and skill acquisition across a variety of educational domains, including K-12 education, higher education, STEM education, professional training, and lifelong learning (Noah & Das , 2021).

The adoption of VR and AR technology in education not only enhances the learning experience of students but also benefits educators by enabling the implementation of innovative teaching techniques and facilitating better understanding of abstract concepts. This technology has the potential to transform traditional teaching methods by providing a more engaging and immersive learning environment (Hung et al., 2023). Additionally, VR and AR have

been found to increase learning motivation and performance, as well as increase student engagement and interest in learning.

In conclusion, the comparison between traditional evaluation methods and VR/AR-based evaluation methods in education highlights the transformational potential of VR and AR technologies. By offering immersive, interactive, and engaging learning experiences, VR and AR have the capacity to revolutionize education by providing safe, controlled, and effective learning environments that improve student learning outcomes and educator effectiveness.

3.4.3. Impact on Engagement and Learning Outcomes

Virtual Reality (VR) and Augmented Reality (AR) are increasingly being integrated into educational environments to increase student engagement and improve learning outcomes in a variety of subjects. Research shows that these technologies offer immersive and interactive learning experiences that are effective in engaging students, facilitating meaningful learning outcomes, and increasing student motivation (Huang et al., 2019; Oyewole, 2024; Booyoesen, 2023; Соснило et al., 2021 ; Car et al., 2022). VR and AR have been found to improve student learning outcomes, learning enjoyment, and knowledge retention in various educational contexts (AlGerafi, 2023; Lytvynova, 2023; Tene, 2024). This technology has the potential to create a dynamic learning environment that can cater to various learning styles and promote collaborative learning (Kuanbayeva, 2024).

In addition, VR and AR have proven to be very beneficial in skills-based education and distance learning, providing an alternative form of face-to-face teaching and improving communication between teachers and students, learner self-efficacy, and interactivity (Li et al., 2022; Zataraín-Cabada et al., 2022). Studies also highlight the transformational role of VR and AR in science and engineering education, offering immersive experiences that facilitate better understanding of complex concepts (Tanbour, 2024; Son, 2024). Additionally, the use of VR in language education shows promise in improving the learning environment, increasing student motivation, and promoting interactive learning (Huang et al., 2021; Lin, 2024).

Although VR and AR offer various benefits, challenges such as the need for teacher training, demands on students' digital literacy, and teacher competency in using VR have been identified. However, with the right support and training, VR can significantly increase student engagement and teaching effectiveness. Overall, the integration of VR and AR technologies in education has the potential to revolutionize traditional teaching methods, providing students with engaging, interactive, and effective learning experiences.

3.4.4. Case Studies and Best Practices

Virtual Reality (VR) and Augmented Reality (AR) have shown significant potential in transforming education by providing interactive and immersive experiences that enhance learning outcomes. AR, in particular, has been noted for its ability to improve classroom practices, empower teachers, enhance self-confidence, problem-solving skills, and leadership abilities (Milkias, 2020). On the other hand, VR and AR technologies have been highlighted as disruptive technologies in education, offering simulated environments for higher quality education delivery and assisting in more efficient and precise surgeries (Godzik et al., 2021). These technologies have been successfully applied in various educational settings, including STEM education, workplace learning, vocational education, and language learning (Kauppinen et al., 2022; Iqbal et al., 2022; Karacan & Akoğlu, 2021).

Moreover, AR has been found to offer students immersive and individualized learning experiences, transforming traditional teaching techniques and improving spatial abilities, real-virtual object alignment, and interactive drawing practices (Khada, 2024; Lim, 2022). Studies have also explored the use of AR in enhancing proficiency in emergency medical procedures and promoting sail education, demonstrating the versatility of AR applications across different fields (O'Connor, 2023; Ji et al., 2023). Additionally, the application of AR has

been remarkable in enriching the student learning experience, especially during times of social distancing such as the COVID-19 pandemic (Alahakoon & Kulatunga, 2021).

Educators face challenges in integrating AR into classroom practices despite its positive outcomes, emphasizing the need for further research and best practices to maximize the effectiveness of AR in education (Nikou, 2024; "Practitioner Proceedings of the 8th International Conference of the Immersive Learning Research Network (iLRN2022)", 2022). Best practices in online education are essential to ensure engaging and beneficial learning environments, with a focus on achieving the same level of competence as traditional face-to-face classrooms (Wise & Opton, 2022). Furthermore, insights into developing reusable and use-case-specific VR content and tools have been proposed to enhance educational VR development (Horst et al., 2022). In conclusion, the successful applications of VR and AR in education have demonstrated their potential to revolutionize teaching and learning practices, offering immersive, interactive, and engaging experiences that cater to diverse learning needs and enhance educational outcomes.

3.5. VR and AR in Training

3.5.1. Use of VR and AR in Professional Training

Virtual Reality (VR) and Augmented Reality (AR) technologies are increasingly being used in a variety of professional training environments, such as industrial, medical and military. This technology offers various applications that increase training effectiveness and efficiency (Ghaednia et al., 2021; Win et al., 2022). In the medical field, VR and AR have been used for pre-operative planning, student training, remote guidance, and patient education in operations such as spinal surgery and awake craniotomy (Yoon, 2023; Harris et al., 2023). This technology provides a platform for detailed anatomical visualization, surgical exposure, and skill enhancement, benefiting both medical students and experienced surgeons.

In industrial environments, VR and AR are proving to be valuable tools for increasing worker productivity, improving employee training, reducing costs, ensuring safety, and addressing skills gaps (Hedayatamma, 2022; Markopoulos et al., 2019; Uppot et al., 2019) . This technology offers an immersive training experience that simulates real-world scenarios, allowing workers to train and learn in a safe environment.

Additionally, in military training, VR has been found to be effective in developing teamwork, communication skills, and decision-making abilities essential for collaborative problem solving (Rudnik, 2023; Fu, 2021). The integration of VR and AR technology in combat training has been highlighted as a method for maintaining military readiness, especially during difficult times such as the Covid-19 pandemic (Fu, 2021). Furthermore, VR and AR have played an important role in education, including maritime safety education, radiology training, foreign language teaching, and vocational training. This technology offers a unique learning experience that engages learners, increases knowledge retention, and enhances the development of practical skills. Overall, the adoption of VR and AR technologies in professional training has shown promising results in a variety of areas, offering innovative solutions to improve learning outcomes, improve skills acquisition, and provide realistic training experiences in a safe and controlled environment.

3.5.2. Training Effectiveness and Evaluation

Virtual Reality (VR) and Augmented Reality (AR) technologies have shown promising results in improving training outcomes by providing realistic scenarios in a safe and interactive environment (Lin, 2023; Kang et al., 2024). This technology offers opportunities for learners to engage in practical experiences, such as virtual travel, interactive learning with 3D objects, and skill practice in controlled environments (Yakubova et al., 2021). Studies show that training with VR and AR can improve technical proficiency, skill acquisition, and overall performance, especially through repeated practice sessions (Gasteiger et al., 2023; Gasteiger et al., 2022).

Moreover, the effectiveness of VR and AR in training is not limited to certain fields but extends to various domains such as healthcare, vocational training, language education, and even psychomotor skills development (Wang, 2024; Siang et al., 2022; Rudnik, 2023) . For example, in healthcare, VR and AR have been used for surgical training, allowing trainees to practice procedures on virtual patients (Alhumaidi, 2023). In language education, this technology offers new pathways for immersive learning experiences (Rudnik, 2023). Additionally, VR and AR have been shown to be beneficial for improving social skills in individuals with autism spectrum disorders (Mosher & Carreon, 2021).

Educators and institutions are increasingly recognizing the potential of VR and AR in improving learning outcomes and skills development (AlGerafi, 2023; Puggioni et al., 2021). By leveraging insights from learners' experiences and overcoming implementation challenges, educational institutions can optimize the assimilation of AR and VR technologies into their training programs (Tan, 2024). Furthermore, AR and VR applications in education have gained traction, especially with the shift towards online learning modules (Noah & Das, 2021).

In conclusion, the integration of VR and AR technologies in training has shown a positive impact on skill enhancement, knowledge acquisition and overall performance in various areas. As this technology continues to develop, further research and implementation efforts are critical to fully exploit its potential to transform training and educational practices.

3.5.3. Learning Engagement and Retention

Virtual Reality (VR) and Augmented Reality (AR) technologies have shown significant potential in increasing engagement and knowledge retention in training in various fields. Studies have highlighted the benefits of AR and VR in providing interactive learning experiences, enabling repeated practice, increasing technical proficiency, strengthening skill acquisition, and improving performance (Ebert & Tutschek, 2019). This technology offers trainees the opportunity to engage in realistic scenarios in a risk-free environment, leading to better outcomes and higher trainee satisfaction (Lovreglio et al., 2020; Ravichandran & Mahapatra, 2023).

Additionally, the use of VR and AR in training has been linked to increased productivity, improved employee training, reduced costs, increased workplace safety, and more efficient skills development (Jones et al., 2021). The immersive nature of VR and AR training enables experiential learning that has been shown to be effective in increasing learning efficiency and knowledge retention (Aihua et al., 2022). Additionally, VR is recognized as a smart, safe, and effective training method compared to traditional approaches such as lectures and non-interactive videos (Iskander et al., 2021).

Furthermore, the accessibility and cost-effectiveness of VR technology makes it an attractive option for vocational education, allowing trainees to access material from anywhere and reducing the need for expensive physical equipment. In the healthcare sector, VR and AR have played an important role in improving the skills of healthcare workers, improving knowledge and attitudes towards dementia, and improving oral care for disabled older people (Gasteiger et al., 2022). This technology has also been used in ophthalmology for surgical training, clinical training, diagnosis, and treatment guidance. In conclusion, the integration of VR and AR technologies in training has shown a positive impact on engagement and knowledge retention. This technology offers an immersive, interactive, and safe learning environment that improves learning outcomes, skill acquisition, and performance across multiple domains.

4. Conclusions

The history and evolution of VR and AR technology in the entertainment industry has undergone a significant journey since the 1960s, showing substantial improvements in applications and user experience. This technology has not only changed the way we play games and enjoy movies but has also penetrated into the fields of education, arts and cultural

heritage preservation. Its huge impact in increasing user engagement, interactivity, and emotional experiences shows that VR and AR have the potential to continue to revolutionize the entertainment industry in the future.

4.1. Implications

The adoption of VR and AR in entertainment has created new opportunities for content creators to offer more immersive and interactive experiences. This technology also has the potential to increase user engagement and create added value in various sectors, including education, arts and cultural heritage preservation. Developers and stakeholders need to consider factors such as presence, immersion, interactivity, and emotion recognition in developing VR and AR applications to maximize user experience.

4.2. Limitations

Although VR and AR technologies have many advantages, there are several challenges in their implementation. These challenges include the need for further research to understand the full potential of this technology, as well as adoption barriers faced by stakeholders, especially amidst the COVID-19 pandemic. In addition, technical limitations and development costs as well as the need for user training are also obstacles to the widespread implementation of VR and AR technology.

4.3. Future Research

Future research should focus on further exploration of how VR and AR can create value in marketing and entertainment. Further studies are also needed to understand the impact of this technology on user experience in various contexts and how it can be effectively integrated in education and training. Additionally, research on how to overcome barriers to adoption and increase the accessibility of these technologies for various user groups would be beneficial. The potential for VR and AR in entertainment remains enormous, and further exploration will open up new and innovative opportunities for immersive and interactive experiences.

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