Confluence of Virtual Learning Environments and Virtual Reality Integration: An In-Depth Study in Digital Animation Education for Acceptance Among Learners

Ng Perng Jeu, University Tunku Abdul Rahman, Malaysia

The Asian Conference on Education 2023
Official Conference Proceedings

Abstract
As innovation continues to reshape educational landscapes, this study delves into the intricate intersection of virtual learning environments and the integration of virtual reality (VR) within the realm of advanced animation education. Drawing from the latest advancements and methodologies, this research examines the convergence of learner perceptions and acceptance within this dynamic context. Through a comprehensive case-study approach, encompassing learner engagement and adoption patterns, this investigation sheds light on the intricate interplay between virtual learning environments and the incorporation of VR technology. The findings provide valuable insights into the multifaceted factors influencing learner acceptance, anticipation of learner experiences, educational effectiveness, and technological affordances. A total of 86 digital animation learners who completed questionnaires based on the Technology Acceptance Model (TAM) and the quality of the learning activity were included in this study. The students perceived the value of the training activity as significant, with substantial correlations observed among various dimensions. This research illustrates the potential of VR as an educational technology and offers fresh perspectives for future research. By synthesizing these technologies with real-world applications, this study contributes significantly to the scholarly discourse surrounding innovative pedagogical frameworks and optimal models, thereby promoting a deeper understanding of how learners embrace and engage with virtual reality in advanced digital animation education.

Keywords: Virtual Learning, Virtual Reality, Technology Acceptance Model, University Education, Digital Animation

Introduction

The integration of digital animation and VR in higher education also revolutionizes skills development. Through the use of these technologies, students can practice and refine technical skills in a simulated environment, allowing for repetitive practice without the need for expensive equipment or physical resources (Pringle et al., 2022). For example, aspiring surgeons can perform virtual surgeries, engineering students can design and test prototypes, and art students can experiment with different artistic techniques, all within a virtual space. This not only enhances their proficiency in their respective fields but also fosters a sense of confidence and competence. Furthermore, the merging of digital animation and VR opens up new avenues for educational innovation. Traditional teaching methods often rely on lectures and textbooks, which can be passive and detached from real-world applications. However, with the immersive and interactive nature of these technologies, educators can create dynamic and engaging learning experiences that cater to different learning styles (Wang et al., 2020). Students can actively participate in their own education, exploring concepts and theories in a hands-on manner (Chuang, 2021). This promotes critical thinking, problem-solving, and creativity, skills that are highly valued in today's rapidly evolving job market.

Additionally, the connecting of digital animation and VR in higher education has the potential to democratize access to education. With the increasing availability and affordability of VR headsets and animation software, students from all backgrounds can have equal opportunities to engage in immersive learning experiences (Bodzin et al., 2020). This can bridge the gap between traditional classroom settings and remote or online learning, providing a more inclusive and accessible education for all. The merging of digital animation and VR in higher education has the power to redefine the way we learn and teach. By harnessing the unique capabilities of each technology, students can unleash their creativity, develop practical skills, and engage in immersive and interactive learning experiences (Sukirman et al., 2021). This transformative convergence holds immense potential for the future of higher education, paving the way for innovative approaches to creative expression, skills development, and educational exploration.

The merging of digital animation and VR will also revolutionize skill development, providing students with a comprehensive toolkit of industry-relevant expertise. While digital animation hone artistic expression, storytelling skills, and proficiency in animation software, VR expands technical capabilities to include 3D modeling, spatial design, and user experience (UX) principles. These skills are in high demand across a wide range of industries, including film, gaming, healthcare, education, and architecture, and open the door to a variety of career paths. Additionally, this fusion of technologies fosters interdisciplinary collaboration that leverages expertise in computer science, art, design, storytelling, and psychology. Students engage in interdisciplinary teamwork to navigate diverse perspectives and integrate knowledge to create innovative and impactful digital experiences. Such collaborations reflect the realities of professional creative industries and prepare graduates for the dynamic and collaborative nature of the modern workplace. Despite the transformative potential of these technologies, integrating these technologies into higher education is hampered by hardware and software costs, accessibility issues, and the need for specialized training for both faculty and students. Issues such as this arise. Overcoming these hurdles requires strategic investments, innovative educational approaches, and continued research to ensure equitable access and effective implementation. In summary, the convergence of digital animation and VR technology heralds a paradigm shift in higher education that redefines the boundaries of creative expression, skill development, and immersive learning experiences. Although

challenges remain, the potential to develop a generation of graduates with the artistic vision, technical skills, and collaborative mindset needed to succeed in a digitalized world is undeniable. By leveraging this convergence, institutions can help students shape a future where imagination and technology intertwine, creating endless possibilities for storytelling, innovation, and meaningful impact across diverse disciplines.

Methodology

The purpose of this study was to explore the willingness of students from university in Malaysia to use web-based virtual reality systems-based learning. To achieve this, the researchers adopted purposive sampling methods to select students who were taking or had taken courses related to digital animation production. Out of the 110 questionnaires distributed, 24 were found to be invalid, while 86 were valid. The questionnaires were completed online for convenience. The questionnaire consists of a 5-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (5), and 20 questions to measure variables that may affect the use of VR technology. We got 110 responses; 24 responses were excluded due to incompletion. After cleaning and preparing the data set, data were analyzed using SPSS version 26 and Excel.

This study specifically focused on full digital animation learning; However, the study specifically emphasized the importance of vr as the foundation of digital animation learning and development. By conducting the research, the aim was to contribute to the understanding and advancement of knowledge in the field of vr learning platform.

Semi-immersive virtual experiences offer participants a unique blend of virtual and physical reality, allowing them to feel as though they are in an alternate world while still maintaining a connection to their surroundings (Dincelli & Yayla, 2022). This type of technology utilizes 3D graphics to create a sense of depth and realism, known as vertical reality depth, which enhances the level of immersion. By incorporating more intricate graphics, the experience becomes even more lifelike.

One of the main advantages of semi-immersive virtual experiences is their applicability in educational and training contexts. These experiences can be used to simulate real-world scenarios and provide learners with a safe and controlled environment to practice and develop their skills (Bryant et al, 2019). For example, medical students can use semi-immersive virtual experiences to perform virtual surgeries, allowing them to gain valuable hands-on experience before working with real patients. To create these semi-immersive experiences, high-resolution displays, powerful computers, projectors, or sophisticated simulators are often used. These technologies replicate certain aspects of real-world mechanisms in a partial manner, allowing participants to interact with virtual objects and environments in a realistic way. This level of realism helps to enhance the learning experience and make it more engaging and memorable.

In addition to educational and training applications, semi-immersive virtual experiences can also be used for entertainment purposes. Virtual reality gaming, for example, often falls into this category. Players can immerse themselves in virtual worlds and interact with characters and objects in a way that feels incredibly real. This type of entertainment experience can be highly engaging and provide a unique form of escapism. This technology has found frequent application in educational and training contexts, as well as in entertainment. With the

continued advancement of graphics and technology, the possibilities for semi-immersive virtual experiences are only expected to grow.

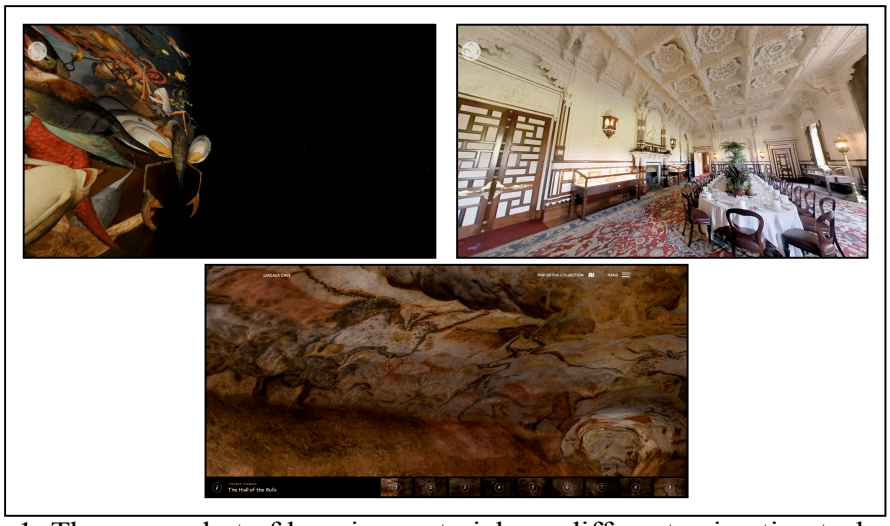

Figure 1: The screenshot of learning materials on different animation techniques.

Data Collection and Analysis

The technology acceptance model can provide empirical explanation regarding users' acceptance of a new information technology. The concept of computer self-efficacy can enhance the explanatory potential of the model (Wang et al., 2023). Built on the theoretical foundation of the technology acceptance model and computer self-efficacy, this research produced a questionnaire to explore user's willingness to adopt a virtual reality assessment system.

This study used Cronbach α as a measure of internal consistency among technical areas included in the item bank. The Cronbach α value of the item bank as a whole was 0.85, proving that the reliability of the item bank was good. To establish expert validity, questions in the item bank were revised according to opinions from post-review discussions with experts and scholars. After the revision, professionals with more than five years of experiences in virtual reality production spent twenty-minutes each trying out the assessment system. Based on their feedback, those questions unclearly expressed were further revised to ensure good content validity. Hence, the item bank used in this study had excellent validity. Lists reliability and validity values of each dimension in the questionnaire and the questionnaire as a whole. internal consistency of each dimension in the questionnaire was evaluated. Cronbach alpha coefficients of dimensions of perceived usefulness, perceived ease of use, users' willingness, and computer self-efficacy are respectively 0.933, 0.851, 0.919and 0.963, respectively. All Cronbach α coefficients were between 0.85 and 0.96, indicating good reliability and good internal consistency of the questionnaire. Good convergent validity means factor loadings of all questions need to reach significant level. In other words, all values need to be above 0.5. In this research, all average variances extracted (AVE) were above 0.8, indicating good validity as shown at Table 1.

Reliability and validity of the questionnaire		
	Cronbach's α	AVE values
Perceived usefulness	0.933	0.90
Perceived ease of use	0.851	0.82
Users' willingness	0.919	0.92
Computer self-efficacy	0.963	0.89
Overall reliability	0.956	

Table 1: Reliability and validity of the questionnaire

Hypothesis	Relationship between Variables	Path Coefficient
H1	Self-efficacy positively correlates with perceived usefulness	0.812 **
H2	Self-efficacy positively correlates with perceived ease of use	0.793 **
H3	Perceived usefulness has a positive effect on users' willingness	0.681 **
H4	Perceived ease of use has a positive effect on users' willingness	0.292**

Table 2: The relationship between variables and the value of path coefficient

This study utilizes the technology acceptance model (TAM) as a foundational framework to investigate the connections between perceived usefulness, perceived ease of use, self-efficacy, and users' willingness in relation to a virtual reality platform's performance assessment system. A model of relationships was established based on the aforementioned findings. The findings revealed that users' perceived usefulness and perceived ease of use directly impact their willingness to adopt an e-book production assessment system.

Specifically, the influence of perceived usefulness (0.68) was found to be more significant than that of perceived ease of use (0.30). The study also found that subjects' computer self-efficacy had a significant and positive influence on their perceived usefulness and perceived ease of use as stated in Table 2. Furthermore, subjects' perceived usefulness and perceived ease of use had a significant and positive influence on their willingness to use the system. Therefore, individuals with higher computer self-efficacy and a greater perception of the usefulness and ease of use of the web-based assessment system are more inclined to use the system. Path analysis results from the study indicate that perceived usefulness and perceived ease of use act as mediators in the relationship between self-efficacy and users' willingness. Additionally, a high level of self-efficacy may contribute to improved learning performance among students. This finding aligns with previous studies that have explored the connection between computer self-efficacy and learning outcomes.

Conclusion

In conclusion, within the Malaysian context, the continuous collaboration between Virtual Learning Environments (VLEs) and Virtual Reality Integration (VRI) presents a groundbreaking and transformative approach to digital animation education. The integration of VLEs and VRI has garnered resoundingly positive engagement and feedback from students, reinforcing its efficacy in fostering a positive and immersive learning experience (Makransky & Petersen, 2021). In future work, the research would undertake as following: (1) increasing the sample size as this will give us a better indication of the acceptance of vr technology; (2) measuring other factors such as immersion, scalability, and diversity; (3) involve a diverse segment of educated and uneducated volunteers to fill out the questionnaire.

By measuring the previous factors in point 2 and examining the influence relationship between the factors with a large sample of diverse segment of educated and uneducated volunteers, research will bring a more detailed view of the Metaverse technology. By harnessing the power of VLEs and VRI, students are provided with a dynamic and interactive educational environment that transcends traditional teaching methods. This cutting-edge integration not only enhances student engagement but also nurtures their creativity and critical thinking skills.

The immersive nature of VRI allows students to experience real-world scenarios and challenges within the digital animation field, providing them with practical skills and preparing them for the demands of the industry. This experiential learning approach has been met with interest and appreciation from students, who report a heightened sense of motivation and excitement in their educational journey. Furthermore, the collaborative nature of VLEs and VRI encourages peer interaction and collaboration, fostering a sense of community among students. This collaborative learning environment not only enhances student learning outcomes but also cultivates teamwork and communication skills that are essential in today's interconnected world (Wu et al., 2021).

The overwhelmingly positive engagement and feedback from students serve as a testament to the immense potential of integrating VLEs and VRI in the Malaysian education system. This integration represents a significant step forward in shaping the future of immersive and engaging learning experiences, empowering students to become adaptable and well-prepared for the evolving digital animation landscape.

Acknowledgements

The author would like to express the deepest gratitude to participants who contributed significantly to the research, such as learners in particularly provided invaluable anticipation in the questionnaire survey. And also, to industrial experts in virtual reality development, their expertise and contributions were instrumental in instructional materials and questionnaire feedback. Their willingness to participate in this study was essential for its accomplishment.

References

Bodzin, A., Junior, R. A., Hammond, T., & Anastasio, D. (2020). Investigating engagement and flow with a placed-based immersive virtual reality game. *Journal of Science Education and Technology*, 30(3), 347–360.

Bryant, L., Brunner, M., & Hemsley, B. (2019). A review of virtual reality technologies in the field of communication disability: Implications for practice and Research. *Disability and Rehabilitation: Assistive Technology*, 15(4), 365–372.

Chuang, S. (2021). The applications of constructivist learning theory and social learning theory on adult continuous development. *Performance Improvement*, 60(3), 6–14.

Dincelli, E., & Yayla, A. (2022). Immersive virtual reality in the age of the metaverse: A hybrid-narrative review based on the technology affordance perspective. The Journal of Strategic Information Systems, 31(2), 101717.

Makransky, G., & Petersen, G. B. (2021). The cognitive affective model of immersive learning (Camil): A theoretical research-based model of learning in immersive virtual reality. *Educational Psychology Review*, 33(3), 937–958.

Pringle, J. K., Stimpson, I. G., Jeffery, A. J., Wisniewski, K. D., Grossey, T., Hobson, L., Heaton, V., Zholobenko, V., & Rogers, S. L. (2022). Extended reality (XR) virtual practical and educational egaming to provide effective immersive environments for learning and teaching in forensic science. *Science & Justice*, 62(6), 696–707.

Sukirman, S., Ibharim, L. F., Said, C. S., & Murtiyasa, B. (2021). A strategy of learning computational thinking through game based in Virtual reality: Systematic review and conceptual framework. *Informatics in Education*.

Wang, R., Lowe, R., Newton, S., & Kocaturk, T. (2020). Task Complexity and learning styles in situated virtual learning environments for construction higher education. *Automation in Construction*, 113, 103148.

Wang, S., Sun, Z. & Chen, Y. (2023). Effects of higher education institutes' artificial intelligence capability on students' self-efficacy, creativity and learning performance. *Educ Inf Technol* 28, 4919–4939.

Wu, W.-C. V., Manabe, K., Marek, M. W., & Shu, Y. (2021). Enhancing 21st-century competencies via Virtual Reality Digital Content Creation. *Journal of Research on Technology in Education*, 55(3), 388–410.

Contact email: ngpj@utar.edu.my