Virtual Technology Learning Innovation In Metaverse-Based Education

A. Muhammad Syafar[1]*, Nurul Fuadi[2]
[1]Informatics Engineering UIN Alauddin Makassar, [2]Physics UIN Alauddin Makassar
andi.syafar@uin-alauddin.ac.id; nurul.fuadi@uin-alauddin.ac.id

ABSTRACT

The digital revolution has driven innovation in various sectors, including education. This research aims to develop and evaluate metaverse-based learning models, which are virtual environments that enable real-time interaction and collaboration between learners and teachers. This model is designed to overcome the limitations of conventional learning methods by providing a more immersive and interactive learning experience. This research methodology involves the design and implementation of metaverse platforms tailored to educational needs, as well as trials on groups of students from various levels of education. Data were collected through observation, interviews, and questionnaires to measure the effectiveness of this learning model in increasing student motivation, participation, and academic achievement. The results showed that the metaverse-based learning model significantly increased student engagement and facilitated more effective collaborative learning. Students report increased learning motivation and better understanding of the material compared to traditional learning methods. In addition, metaverse platforms allow flexibility in learning, allowing students to learn anywhere and anytime. The metaverse-based Learning Model in the aspect of student learning test results is in the high category while in the aspect of student response to learning is in the range of 3.33 with a very valid category.

KEYWORDS: Metaverse-Based Learning, Digital Education, Virtual Interaction, Real-Time Collaboration, Learning Motivation, Educational Innovation.

INTRODUCTION

The rapid advancement of technology has brought about significant changes in various sectors, including education. Traditional educational methods are increasingly being complemented and, in some cases, replaced by innovative technological solutions. One such groundbreaking innovation is the integration of virtual technology into educational environments, particularly through the concept of the metaverse.

The metaverse, a collective virtual shared space created by the convergence of virtually enhanced physical reality and physically persistent virtual space, is becoming a new frontier for educational innovation. It offers a highly immersive and interactive platform where students can engage with content in ways that transcend the limitations of traditional classrooms. This virtual realm provides unique opportunities for experiential learning, where theoretical knowledge can be applied in simulated real-world scenarios.

In metaverse-based education, students can participate in virtual classrooms, laboratories, and collaborative projects with peers from around the world, all within a 3D space that mimics or enhances physical reality. This approach not only fosters greater engagement and motivation among students but also accommodates diverse learning styles and needs. Furthermore, it enables educators to design and implement more dynamic and flexible curricula that can adapt to the rapidly evolving demands of the modern world.

This study aims to explore the potential of virtual technology learning innovations within the metaverse and their impact on educational outcomes. By examining current implementations and case studies, we seek to understand the benefits, challenges, and future prospects of metaverse-based education. The research will also delve into how these innovations can enhance learning experiences, improve accessibility, and prepare students for the challenges of the 21st century.

As educational institutions worldwide seek to leverage technology to improve learning outcomes, the metaverse presents a promising avenue for creating more inclusive, engaging, and effective educational environments. This paper will contribute to the growing body of knowledge on virtual technology in education and provide insights into how the metaverse can be harnessed to drive educational innovation.

METHOD

This type of research to develop learning materials in the metaverse uses research and development methods. to explore the impact of virtual technology learning innovations in metaverse-based education.

In this development, the researcher uses quantitative analysis techniques in conducting data processing by following the steps in the system design method based on *the System Development Life Cycle.* The stages carried out include: Planning stage, Analysis stage, Design stage, Implementation stage, Testing and Integration stage, and Maintenance stage.
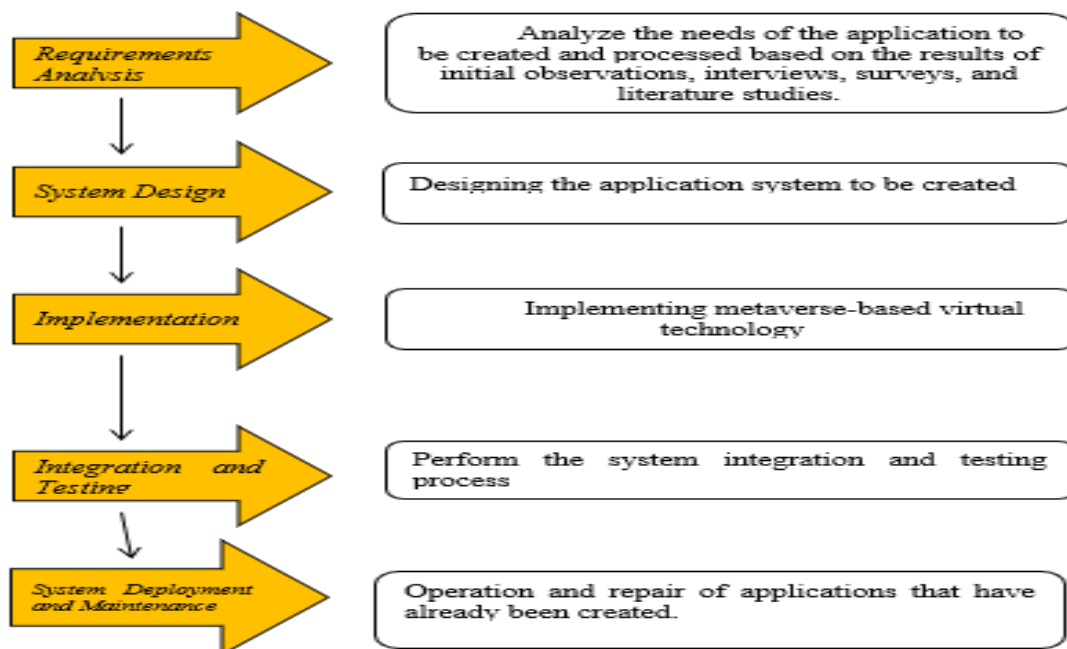

Requirements Analysis	→	Analyze the needs of the application to be created and processed based on the results of initial observations, interviews, surveys, and literature studies.
System Design	→	Designing the application system to be created
Implementation	→	Implementing metaverse-based virtual technology
Integration and Testing	→	Perform the system integration and testing process
System Deployment and Maintenance	→	Operation and repair of applications that have already been created.

Figure 1. Schematic of the stages of the application development plan
using the *Waterfall model*

RESULT AND DISCUSSION

The metaverse is an interconnected social network, an immersive environment of networks within a platform with many persistent users. It allows seamless communication between its users to occur in real-time and dynamic interaction using digital technology. The main implementation is a virtual world in which avatars can interact. Metaverse technology also features social and immersive VR platforms that are compatible with online video games, open virtual worlds, and AR collaborative spaces.

The application of this metaverse technology, assisted by Virtual Reality glasses that can be connected to gadgets owned by teachers and students, can make learning in the classroom easier.

Figure 1. Virtual implementation of technology in learning

Table 1. Results of Validation of Virtual Media Technology

Assessed Aspects	Validator		Average	Category
	V1	V2		
Programming	3,50	3,00	3,25	Valid
Interaction	3,67	3,33	3,50	Highly Valid
Efficiency	3,25	3,25	3,25	Valid

Overall Average	**3,33**	**Highly Valid**

Data from validity tests by expert validators on the level of validity of Learning media in Learning Model Development .The Learning Model is in the range of **3.33** with the Very Valid category **.**

Based on the results of the assessment of each aspect of the Learning Media, the average of all aspects assessed was 3.33 and was in the Very Valid category. The validation results showed that there were validator responses, including: (a) Sensitive learning media in detecting object markers; (b) learning media needs to be added with learning videos; and (c) there are objects that are different from the markers in the learning module.

Designing a Metaverse-based Learning Model includes setting CPMK and setting learning achievement indicators. As well as developing a learning model design based on the components of the learning model consisting of compiling learning syntax, establishing a social system, establishing reaction principles, establishing a support system, and determining the impact of learning.

CONCLUSION

The integration of virtual technology learning innovations within metaverse-based education represents a transformative approach to modern education. This study highlights several key benefits and challenges associated with this innovative educational paradigm. The immersive and interactive nature of the metaverse significantly increases student engagement and participation, providing dynamic learning experiences that traditional classrooms cannot offer. Metaverse-based education also enables practical, hands-on learning through simulations and virtual experiments, enhancing students' understanding of theoretical concepts. The validity of the Metaverse-based Learning Model is in the range of 3.33 with the category of very valid.

REFERENCES

Afandi, M. (2013). *Model dan Metode Pembelajaran di Sekolah*.

Anderson, P. (2022). The Metaverse: Exploring the Virtual World's Educational Potential. *Journal of Educational Technology*, 18(3), 45-59.

Alkhamisi, O. (2013). Rise of Augmented Reality: Current and Future Application Areas. *International Journal of Internet and Distributed Systems*, *1*(1), 25–34.

Anggeraini, Y. (2019). Literasi Digital: Dampak dan Tantangan dalam Pembelajaran Bahasa. *SEMINAR NASIONAL PASCASARJANA 2019*, 386–389.

Ayu, L. T. (2014). Pengaruh Metode Pembelajaran Diskusi Berbasis Lesson Study Terhadap Aktivitas dan Hasil Belajar Biologi Dengan Menggunakan Assessment Portofolio (Siswa Kelas X Semester Genap SMA Negeri Kalisat Tahun Ajaran 2012/2013). *Pancaran*, *3*(1), 111–120.

Syafar,A.M. , M. Agung, W. Wisanty, Haswah, and J. N. Amanda (2023), "360- Degree Panoramic Visualization in Archaeological Documentation: An Interactive Learning Tool,", pp. 101–109. doi: 10.2991/978-2-38476-084- 8_15.

Syafar, A. M. (2021). Filsafat dan Rekonstruksi Teori Mata Kuliah Matematika Komputer pada Learning Centre Area (LENTERA) Virtual Class. ALL Grafika Makassar.

Syafar, A. M., Gani, H. A., & Agung, M. (2023). Development Of A Learning Model For Industrial Control Engineering Courses With AR Dan VR technology. Proceedings of the 3rd International Conference on Social and Islamic Studies, 289–294.

Syafar, A. M., Hasrul, M. H., Nurhidayat, A. M., & Akhiruddin. (2021). Aplikasi Pengenalan Buku Mata Kuliah Teknologi Informasi Dengan Teknologi Augmented Reality Berbasis Android. Jurnal Instek, 6(2), 245–253