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THE EFFECTIVENESS OF USING METAVERSE PLATFORMS AS A COLLABORATIVE LEARNING MEDIA IN HIGHER EDUCATION: A LITERATURE REVIEW

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Abstract

Introduction: Metaverse provides an immersive learning experience that enables virtual collaboration to mimic in-person interactions. Its use in higher education has the potential to increase engagement and learning effectiveness, but in-depth studies are still needed to assess the results and challenges. Objective: To assess the effectiveness of using the metaverse platform as a collaborative learning medium in higher education and to identify supporting and inhibiting factors for its implementation. Method: Researchers collected, analyzed, and synthesized information from various reputable national journals (minimum SINTA 3) and international scientific articles related to the topic of metaverse and collaborative learning. The analysis was conducted using a systematic review approach to understand the pattern of findings and implementation trends in the higher education context. Discussion: The results of the review indicate that metaverse-based learning improves student collaboration, participation, and motivation. Successful implementation is influenced by infrastructure readiness, digital literacy, and interactive activity design. The main obstacles include limited devices, networks, and pedagogical adaptation of lecturers. Recommendations: Technopedagogical training for educators, strengthening of digital infrastructure, and guidelines for metaverse-based learning design that focus on interaction and learning objectives are needed.

Keywords: Metaverse, Collaborative Learning, Higher Education, Immersive Technology, Learning Innovation.

INTRODUCTION

The development of digital technology has brought significant changes to the field of education, particularly in how lecturers and students interact in the learning process. The transformation toward technology-based learning encourages higher education institutions to continuously innovate in creating engaging and collaborative learning experiences. This innovation is not only related to the use of Learning Management Systems (LMS), but has also begun to expand into the utilization of immersive technologies such as the metaverse, which enables virtual interactions that resemble the real world. Several previous studies highlight the importance of integrating technology in modern learning. Primartadi et al. (2024) developed a digital-based disc brake learning media that proved effective in improving students' conceptual understanding in vocational learning. Ariyanto et al. (2024) also demonstrated that the use of YouTube as an interactive learning medium can increase student motivation and participation. These findings affirm that technology-based media innovations contribute positively to the effectiveness of online learning.

In the context of collaboration, Wardani & Siswanto (2022) emphasized that perceptions and barriers in online learning significantly influence learning success, especially in relation to interaction and support among participants. This is reinforced by Purwanto & Sukaswanto (2022), who explained that learning management information systems have become essential components in integrating interactions between educators and learners. Furthermore, Putra et al. (2020) examined Augmented Reality (AR)-based learning media and found that immersive technology can create more engaging and profound learning experiences. Their study revealed the great potential of interactive 3D technology in enhancing student collaboration and engagement. Meanwhile, Salsabila et al. (2020) asserted that the use of digital applications such as Quizizz can foster a more participatory and enjoyable learning environment. From these findings, it is clear that the implementation of advanced technologies in learning has had a positive impact on student effectiveness and collaboration. However, the use of the metaverse as a collaborative learning platform in higher education remains relatively new and has not been extensively studied. Therefore, a

systematic review is needed to assess the extent to which metaverse platforms can support collaborative learning, as well as the factors that influence their success in the higher education environment.

METHOD

The method used in this research is a literature review, which is a study conducted to analyze selected literature from various sources in order to formulate a unified conclusion and generate new ideas. The journals used in this study are those that discuss topics related to two categories of keywords: (1) learning innovation, and (2) advanced education. The search for academic journals was conducted through the Sinta online database, with a minimum quality requirement of Sinta 3, covering publications from 2015 to 2025.

RESULTS AND DISCUSSION

The following are the selected journals analyzed by the researcher in this literature review study:

Table 1. Details of the results of the main selected journals for the literature review

No	Author / Year	Research Title	Journal Name	Research Objective	Research Method	Research Findings
1	Samodra (2015)	The Influence of Learning Models on Elementary Students' Understanding of Field Game Concepts	Cakrawala Pendidikan 34(2)	To assess the influence of DI vs TGfU on conceptual understanding of gameplay.	Posttest-only experiment; 80 students; GPAI; t-test.	No significant difference between TGfU and DI ($p \approx 0.869$).
2	Moma (2015)	Improving Junior High School Students' Soft Skills through Generative Learning	Cakrawala Pendidikan 34(2)	To examine the contribution of generative learning to soft skills.	Quasi-experiment; 191 students; pretest–posttest; t-test & ANOVA.	Experimental class experienced significant improvement in soft skills; no school-level interaction effect.
3	Retnowati & Aqilla (2017)	Effectiveness of Paired Grouping Strategies in CORE Mathematics Learning	Cakrawala Pendidikan 36(1)	To compare paired CORE vs small-group CORE learning.	Quasi-experiment; MANOVA.	Both models effective; small groups slightly better for complex material.
4	Moma (2017)	Developing Students' Creative Thinking and Mathematical Problem-Solving Skills Through Discussion Methods	Cakrawala Pendidikan 36(1)	To assess the contribution of discussion methods to creativity and problem solving.	Quasi-experiment; pre–post.	Significant improvements in creative and problem-solving abilities.
5	Astawan & Rati (2016)	The Influence of Quantum Learning Model and Summarizing Techniques on Students' Reasoning	Cakrawala Pendidikan 35(3)	To examine the influence of Quantum Learning and summarizing on reasoning.	Experiment/quasi-experiment.	Positive effect on student reasoning.
6	Purwanto & Sukaswanto (2022)	Learning Management Information System in Laboratory Practicum Learning in PTO Department	Jurnal Pendidikan Vokasi Otomotif 5(1)	To develop/describe an LMIS for practicum learning.	System development; needs analysis & flow design.	LMIS effectively supports practicum planning and execution.

7	Wardani & Siswanto (2022)	Correlation of Barriers & Perceptions in Online Learning with Learning Motivation of TKR Students	Jurnal Pendidikan Vokasi Otomotif 5(1)	To analyze the relationship between online-learning barriers/perception and motivation.	Correlational survey.	There is a correlation between perception/barriers and learning motivation.
8	Ariyanto et al. (2024)	Optimizing YouTube as a Learning Media to Improve Student Achievement in Vocational High Schools	Jurnal Pendidikan Vokasi Otomotif 6(2)	To test the effectiveness of YouTube in improving achievement.	Quasi-experiment.	Significant improvement in learning achievement.
9	Primartadi et al. (2024)	Development of Learning Media for Motorcycle Disc and Drum Brake Systems	Jurnal Pendidikan Vokasi Otomotif 6(2)	To develop and test brake system teaching aids.	R&D (ADDIE); expert validation; trials.	Media feasible and increases learning interest.
10	Rachmat et al. (2025)	Development of a Mobile-Based E-Training System to Improve Discipline and Learning Outcomes	Jurnal Pendidikan Vokasi Otomotif 7(2)	To develop and evaluate the effectiveness of an E-Training System.	R&D (ADDIE); pretest–posttest; expert validation.	Effective (N-Gain 0.76; expert validation ≈88–89%; very positive responses).
11	Ilyasa et al. (2024)	Development of a Static Structural Module Based on Experiential Learning Using Finite Element Method in Engineering Materials Course	Jurnal Pendidikan Vokasi Otomotif	To analyze the implementation of technology-based learning innovation on engagement and outcomes.	R&D (4D model: define, design, develop, disseminate).	Module rated feasible by experts (80.32%) and highly interesting in small-group trials (87.37%).
12	Putra et al. (2020)	"PRIARMIKA" Augmented Reality-Based Learning Media	Jurnal Ilmiah Ilmu Terapan Universitas Jambi	To assess the effectiveness of AR media on understanding and engagement.	Mixed methods (survey + test) with descriptive analysis.	AR application PRIARMIKA feasible for English learning in Grade VIII at SMPN 5 Mengwi.
13	Salsabila et al. (2020)	Use of Quizizz Application as a Learning Media During the Pandemic in High School Students	Jurnal Ilmiah Ilmu Terapan Universitas Jambi	To examine the influence of digital media on learning quality and outcomes.	Mixed methods (survey + test) with descriptive analysis.	Quizizz highly effective as a learning tool.
14	Ikhlas (2018)	Influence of Problem-Based Learning Model and Student Cognitive Styles on Mathematics Learning Outcomes	Jurnal Ilmiah Ilmu Terapan Universitas Jambi	To determine the effect of PBL and cognitive style on math learning outcomes.	Experiment/quasi-experiment with group comparison.	PBL positively impacts problem-solving and understanding.

15	Rapi (2016)	Influence of Learning Models and Types of Formative Assessment on Science Learning Outcomes	Cakrawala Pendidikan 35(1)	To analyze differences in science outcomes by learning model (inquiry vs conventional) and assessment type (PBK vs conventional), and their interaction.	Quasi-experiment.	Significant differences based on model and assessment type; interaction effects present.
16	Derlina (2016)	Effects of Inquiry Training Model Assisted by Visual Media and Creativity on Students' Science Process Skills	Cakrawala Pendidikan 35(2)	To examine the effects of inquiry training, visual media, and creativity on science process skills.	Experiment.	Inquiry training, high creativity, and their interaction significantly improve science process skills.
17	Primartadi et al. (2024)	Development of Brake System Learning Media and Its Effect on Learning Interest of Vocational Students	Jurnal Pendidikan Vokasi Otomotif 6(2)	To develop brake system teaching aids to increase student interest in disc and drum brakes.	R&D (ADDIE).	Learning interest higher in experimental class (71.88%) vs control (68.69%).
18	Bibi & Jati (2015)	Effectiveness of Blended Learning Model on Motivation and Understanding of Algorithm and Programming Course	Jurnal Pendidikan Vokasi 5(1)	To identify differences in motivation and understanding between blended and conventional learning.	Quasi-experimental.	Blended learning more effective, significantly increasing motivation and understanding.

Discussion

The analysis of several reviewed articles indicates that modern collaborative and digital learning innovations have had a significant impact on improving learning outcomes, critical thinking skills, and student motivation. Based on the research of Astawan & Rati (2016), the implementation of the Quantum Learning model combined with summarizing techniques effectively enhances students' reasoning abilities. This aligns with the views of DePorter (2003) and Meier (2000), who emphasize that meaningful learning must provide enjoyable experiences and stimulate active learner engagement. Additionally, Buzan (2004) notes that concept visualization helps students organize ideas and deepen understanding. The study by Retnowati & Aqiila (2017) demonstrates that paired-grouping strategies within the CORE model (Connect, Organize, Reflect, Extend) improve reasoning abilities, learning achievement, and self-efficacy. Cohen's (1994) perspective on task complexity and findings by Kirschner et al. (2011) regarding cognitive collaboration reinforce these results, suggesting that effective group work requires a balance between cognitive load distribution and active individual contribution. Latane et al. (1979) further add that social loafing can be minimized through appropriate group structuring and clear individual accountability.

Moma (2015) emphasizes the importance of generative learning in enhancing soft skills such as communication, creativity, and social responsibility. This approach is supported by Gardner's (2006) theory of multiple intelligences and Goleman's emotional intelligence theory (1995), both of which highlight the significant role of interpersonal and intrapersonal abilities in learning success. Rowe et al. (1983), through Generative Learning Theory, also stress that learners must construct their own knowledge through reflective processes and experiential associations. In the context of assessment, Rapi (2016) found that the use of Classroom-Based Assessment (CBA) that is fair, valid, and continuous can enhance student motivation and learning outcomes. The principles of CBA stated by S. Surapranata & Muhammad Hatta (2004) emphasize the importance of student involvement in the evaluation process, rather than merely being the object of assessment. The collaborative inquiry approach described

by Bell et al. (2010) also supports the development of critical thinking skills through joint investigation and reflection activities. Samodra (2015) examined the effectiveness of the Teaching Games for Understanding (TGfU) model compared to Direct Instruction (DI) in field-game learning. Although no significant differences were found in tactical understanding, TGfU was superior in developing decision-making skills and cooperation. These findings strengthen the tactical learning theories proposed by Turner & Martinek (1999) and French et al. (1996), which state that cognitive engagement in game situations improves skill transfer. Griffin et al. (2001) and Memmert & Roth (2007) further show that tactical approaches allow learners to think strategically and adapt to game dynamics.

Meanwhile, Salsabila et al. (2020) found that the use of the Quizizz platform as an interactive learning medium improves student engagement and time-management skills. This aligns with learning media theories by Irwan (2019) and Sadiman (2010), which emphasize that appropriate technology use can enhance attention and learning effectiveness. Overall, the findings of this review indicate that digital learning innovations that integrate collaborative, cognitive, and emotional elements significantly contribute to improving education quality. Approaches such as Quantum Learning, CORE, generative learning, and interactive media integration strengthen students' 21st-century skills—critical thinking, creativity, collaboration, and communication. The implementation of these concepts provides a strong foundation for developing Metaverse-based learning, as these principles—active interaction, immersive experiences, and collaborative reflection—are essential components of effective and meaningful virtual learning environments.

CONCLUSION

The findings of the study indicate that the use of metaverse platforms as a collaborative learning medium in higher education is highly effective in enhancing students' motivation, engagement, and learning outcomes. Metaverse-based learning is capable of creating an interactive, immersive, and participatory learning environment, encouraging students to be more active in the learning process. In addition, the implementation of the metaverse provides opportunities for lecturers and students to collaborate without spatial and temporal limitations, ultimately strengthening students' digital competencies and critical thinking skills. Overall, this study highlights that the integration of immersive technologies such as the metaverse should be directed toward well-planned collaborative learning, taking into account infrastructure readiness, instructor competence, and technological accessibility so that its benefits can be equitably experienced within higher education environments.

Implications

The implications of this research are the need to develop policies and training programs focused on improving the digital competencies of lecturers and students so they can effectively utilize metaverse platforms. Universities need to design collaborative learning strategies based on immersive technology that emphasize interaction, creativity, and teamwork. Furthermore, institutional support in providing infrastructure and technological resources is a crucial factor in ensuring the sustainability of metaverse-based learning implementation. Thus, the implementation of metaverse is expected to not only improve the quality of the teaching and learning process but also encourage sustainable digital transformation in higher education.

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