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Metaverse: Improving the Quality of Indonesian Education in the Era of Society 5.0

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ABSTRACT

Paper-based learning media is starting to be replaced by digital-based learning media. This research discusses the metaverse which can be used as a learning medium in the era of society 5.0 in order to improve the quality of Indonesian education in the future. The method used in this research is a literature study, in which researchers collect library data from relevant and up-to-date scientific journal sources. The research results show: 1) the metaverse is developing massively, considering that the metaverse is an interconnected social network. The implementation of metaverse in the world of education has a huge opportunity to support the learning process even better. 2) Metaverse can create a learning experience that is better, more inclusive, up to date, and more relevant to future demands. 3) Metaverse provides many benefits, including more interactive learning, effective training and development, a better learning experience, enabling distance/online learning, enhancing a more enjoyable learning experience, personalizing learning, learning visualization, Game-Based learning, Role Play and Perspective taking. 4) By understanding the advantages and disadvantages of using Metaverse, educators can plan appropriate steps to integrate this technology into modern education, thereby achieving an increase in the quality of education in Indonesia.

Keywords: Metaverse; Indonesian Education; Society 5.0.

INTRODUCTION

Learning media that is currently developing tends to utilize technology in every development (Effendi & Wahidy, 2019), print-based learning media is being reduced in use and switching to digital-based learning media, various research is being carried out to create effective learning media to be used by students. in Indonesia and throughout the world, every development in learning media must be understood by educators (Purnasari & Sadewo, 2020). So that in the learning process students can understand being guided by educators to achieve the desired learning goals. Metaverse is a three-dimensional virtual space technology innovation that is currently developing in the era of society (Widianto et al., 2021), if metaverse is linked to learning media at this time, there are many things that will benefit the Indonesian learning and education process (Hasanah & Budiyo, 2024).

Education has an important role in developing the quality of human resources in the era of society 5.0 (Indarta et al., 2022). The role of schools and teaching staff is to participate in transforming learning which does not only focus on one source such as books, but teaching staff can develop insight and receive information from various sources such as the internet and social media. As educators in the era of society 5.0, educators must have skills in the digital field and think creatively and innovatively. According to Zulfikar Alimuddin, Director of Hafecs (Highly Functioning Education Consulting Services) assesses that in the era of society 5.0, educators are required to be more creative, innovative and dynamic in teaching in the classroom. Therefore, there are three things that educators must utilize in the era of society 5.0, including the Internet of Things in the world of education (IoT), Virtual/Augmented reality in the world of education, the use of Artificial Intelligence (AI) in the world of education to find out and identify the learning needs needed by students. There is one technological development that we often hear about, namely the metaverse (Marliya et al., 2021).

In general, learning media that are often used in learning include audio media, visual media, audio visual, print media and e-learning (Rahmi & Azrul, 2021). In its development, learning media continues to experience innovation and renewal (Alamsyah et al., 2022). In line with technological developments, one of the newest technologies in the current era is Metaverse. The emergence of the metaverse was initiated by Facebook founder Mark Zuckerberg (2021) on October 29 announcing that Facebook would change its name to Meta and also make significant investments in the development of metaverse technology. This metaverse is a technology that has slight differences from Augmented Reality and Virtual Reality (Indrabayu et al., 2022). Park, S.M., & Kim, Y. G. in (Indarta et al., 2022) stated that there are three things that differentiate Metaverse from Augmented Reality or Virtual Reality, two technologies that emerged before Metaverse. First, if studies related to Virtual Reality are focused on physical approaches and rendering, then Metaverse has a stronger aspect as a service with more sustainable content and social meaning. Second, Metaverse does not have to use Augmented Reality and Virtual Reality technology. So, even if a platform does not support Virtual Reality and Augmented Reality, the platform can still be a Metaverse application (Amiretta, 2022). Third, the Metaverse has a scalable environment that can accommodate many people, this is very important to strengthen the social meaning emphasized by this technology (Xi et al., 2023).

Humans as technology activists, having a clear and broader understanding of the past of virtual media is very important for articulating creative future visions and innovative solutions to complex problems with immersive technology (Nugraha et al., 2023). This knowledge is critical for future

metaverse applications. Paying attention to how important it is to increase students' understanding and interest in learning, as well as improving the quality of education in Indonesia, with the emergence of this metaverse it can be utilized in education, therefore to improve the quality of education through the metaverse, it is necessary to study this metaverse in depth, in its use, especially in Indonesia metaverse-based education is still less popular (Endarto & Martadi, 2022). Through this article the author will describe the use of metaverse in education.

METHODS OF RESEARCH

The method used in this article is literature study, by collecting journals and reading and comparing each journal's contents related to the article title (Sjafei, 2022). Journal articles were obtained through searches on Google Scholar, each journal's contents have differences that will be compared with each. A literature study is a critical review of what has been researched on a particular topic, which can be anything, whether from books, journal articles, or other sources. The article search procedure is carried out on the Google Scholar page by typing the keywords Metaverse, Learning Media and Era Society 5.0. The scientific articles that we have obtained come from international journals, accredited national journals from 2020. The validation and review process includes several provisions including that the journal can be accessed for free, the quality of the research methodology in the article, the quality of the data presentation and discussion, the adequacy of the data for analysis, up to date and relevant. The results of validation and review of scientific articles are presented in paragraph form.

RESULT AND DISCUSSION

Based on the results of the analysis carried out, it can be seen that the metaverse and education have begun to be hotly discussed by various researchers since recently. The scientific articles that have been searched for were obtained from the Google Scholar, Sinta, DOAJ databases using the keywords "Metaverse", "Learning Media" and "Era Society 5.0" within the last five years. The following are the results of a review of several related articles:

- 1) *Developing Teacher Competency at SMKN 1 Labang Bangkalan through Creating Augmented Reality Learning Media with Metaverse* (Sari et al., 2020).

Review results: Currently technology has entered the Era of Society 5.0, where technology using the internet is increasingly being used. Along with the development of technology and information and referring to teacher competence in the Teacher and Lecturer Law Number 14 of 2005, a teacher is expected to be able to utilize technology, information and communication in implementing learning. This is necessary in order to improve the quality of education and learning in schools. One effort to increase teacher competency regarding learning media is through training in creating Augmented Reality learning media using the metaverse application. In the article it was found that: training in developing Augmented Reality learning media using metaverse applications can develop teacher skill competencies related to learning media, 93% of training participants stated that developing Augmented Reality learning media using metaverse applications was useful.

2) *Educational applications of metaverse: possibilities and limitations* (Kye et al., 2021).

Review results: This review aims to define 4 types of metaverse and explain the potential and limitations of their educational applications. The metaverse roadmap categorizes metaverses into 4 types: augmented reality, lifelogging, mirror world, and virtual reality. An example of the application of augmented reality in medical education is an augmented reality t-shirt that allows students to examine the inside of the human body as an anatomy laboratory. Next, a research team at a hospital in Seoul developed a spine surgery platform that applies augmented reality technology. The potential of the metaverse as a new educational environment is suggested as follows: a new social communication space; a greater degree of freedom to create and share; and the delivery of new, high-immersion experiences through virtualization. Some of the limitations may be weaker social connections and possible invasion of privacy; the commission of various crimes due to the virtual space and anonymity of the metaverse; and maladaptation to the real world for students whose identities are not yet known. It is predicted that the Metaverse will change our daily lives and economy outside of gaming and entertainment. Metaverse has unlimited potential as a new social communication space. The following future tasks are suggested for the use of the metaverse in the educational field: first, teachers should carefully analyze how students understand the metaverse; second, teachers must design classes for students to solve problems or carry out projects cooperatively and creatively; third, educational metaverse platforms must be developed to prevent misuse of student data.

3) *Use and Development of Augmented Reality-Based Applications for the World of Education* (Sholeh et al., 2021).

Review results: Learning material that examines Augmented Reality (AR) in the information technology study program curriculum at vocational high schools is not yet included in the material that must be provided. So that students can understand AR technology and can develop simple AR applications, activities need to be held. So the existing problem, namely that students have not yet received AR knowledge, can be bridged. The development of AR is very important for students so that students can follow AR developments. This is because the use of technology (AR) is currently being used in various fields, including in the field of education. Using AR in learning materials can provide a more detailed explanation of the material. By using AR, the material can be presented in 3D and can be equipped with narration and sound. The implementation method is carried out by providing training, especially in introducing AR to students at SMK Negeri 1 Magelang. The stages before conducting training in the form of a webinar are the preparation stage, implementation stage and activity evaluation stage. At the evaluation stage, students fill out a questionnaire and a validity and reliability test is carried out. The result of the activity was a webinar introducing AR technology. So that students can create simple applications that use AR, in this webinar the software used is Metaverse and Unitear. The results of questionnaire data processing showed that the material presented in the webinar was easy to understand, 25 students answered strongly agree, 86 agreed, 8 students did not know and 3 students disagreed. Students' answers to the question whether making AR applications with Metaverse is easy to understand, 16 answered strongly agree, 93 answered agree, 11 students answered don't know and 2 students answered disagree. Validity and reliability tests were carried

out using SPSS on all questionnaire items. The validity test results for all items are valid. This valid result is based on the calculation for all items of the calculated r value $> r$ table (0.1793) and the reliability test, Cronbach's α value

- 4) *Game based learning with artificial intelligence and immersive technologies: an overview* (Dyulichева & Glazieva, 2021).

Review results: Game-based learning is a new perspective direction in education because today's young generation has been exposed to computer and mobile games since early childhood, and these activities are starting to be considered normal. Research also states that educational games on computers and mobile have a big contribution to improving cognitive and social skills. The existence of Metaverse which applies AR and VR technology aimed at providing interactive experiences in the study of abstract concepts shows promising results in the field of education. This integration between Metaverse and Game-based Learning is an innovation in the field of education that has a very positive impact regarding the development of problem solving, cognitive, analytical, mathematical thinking, communication, creativity and management skills.

- 5) *Metaverse: Challenges and Opportunities in Education* (Indarta et al., 2022).

Review results: Metaverse is a three-dimensional virtual space technology innovation which is currently making many people curious both because of its very rapid development and its implementation which is starting to be widely used in various sectors of life. This research study discusses the challenges and opportunities of the metaverse in the world of education, as well as how it is applied in the world of education. The research results show that the popularity of Metaverse has reached its peak in the last few months and the acceleration of metaverse technology in the world of education has been seen with the existence of digital learning media applications based on augmented reality and virtual reality. Metaverse is believed to be able to overcome existing limitations in the world of education, such as limited class capacity due to the pandemic, limited distance and time to enter class, and so on. With the concept of a virtual world, online learning can be done more interactively without eliminating the student's learning experience. The method of learning anywhere and anytime is an interesting concept that is liked by many generation Z today. Metaverse is predicted to enter many areas of human life in the next 10-15 years.

- 6) *Overview: Technology Roadmap of the Future Trend of Metaverse based on IoT, Blockchain, AI Technique, and Medical Domain Metaverse Activity* (Mozumder et al., 2022).

Review results: Metaverse is defined as a collection of technological gadgets and metaverses connected to IoT, Blockchain, Artificial Intelligence, and all other technology industries including the medical field. IoT and Metaverse are digital twins, Metaverse uses maximum IoT devices in its virtual workstations. This data has a unique identifying tag and is used as trackable data in the blockchain-based Metaverse. In the Metaverse, that data becomes a valuable resource for artificial intelligence. Metaverse uses artificial intelligence and blockchain technology to build a digital virtual world where you can safely and freely engage in social and economic activities that transcend the boundaries of the real world, and the adoption of these latest technologies will accelerate. In the article it is explained that the use of AR in the health education sector has a significant impact on training and improving medical skills in the future. An example of the

- implementation of Metaverse and AR in health education is Microsoft HoloLens technology used by surgeons to speed up surgical procedures.
- 7) *Metaverse as an Effort to Face Future Educational Challenges* (Barlian et al., 2022).
Review results: Optimizing the use of technology is a challenge for education in the future as an effort to ensure the availability of superior human resources. With a critical analysis method using data collection from library research to examine the presence of the metaverse in the world of education in order to anticipate its initial application in the education system in Indonesia, especially in an effort to answer the challenges faced in the future. Metaverse is a massive virtual environment parallel to the physical world, where users interact through digital avatars. The advantages and disadvantages of the metaverse can be used as an alternative consideration in efforts to develop education development strategies in Indonesia. Education in the metaverse era is no longer limited by time and space, so every educational institution will compete globally and the winner of the contest will of course be based on the quality of education offered.
 - 8) *Metaverse* (Mystakidis, 2022).
Review results: Metaverse is a post-reality universe, an eternal and persistent multi-user environment that combines physical reality with digital virtuality. It is based on the convergence of technologies that enable multisensory interactions with virtual environments, digital objects and humans such as virtual reality (VR) and augmented reality (AR). Therefore, the Metaverse is an interconnected social web, an immersive network environment in a persistent multiuser platform. This enables user communication to be realized seamlessly in real-time and dynamic interactions with digital artifacts. Its first iteration was a network of virtual worlds where avatars could teleport between them. Contemporary iterations of the Metaverse feature social and immersive virtual reality (VR) platforms compatible with massively multiplayer online video games, open game worlds, and augmented reality (AR) collaborative spaces.
 - 9) *Opportunities and Challenges of the Metaverse as a History Learning Media: A Systematic Literature Review* (Alim, 2023).
Review results: Massive metaverse technology was developed in the last decade. The use and development of the metaverse in the education sector is considered to be in line with the concept of society 5.0 and 21st century competencies. Innovation makes the learning process interactive by fostering critical thinking, communication, creative thinking, and collaboration. The development of metaverse in the education sector is an effort to present the concept of student center learning. There is a great opportunity for metaverse technology in the world of education to be developed to improve the quality of education. The presence of metaverse technology has challenges such as crime and digital data security and a lack of humanity. This needs to be balanced with an understanding of digital literacy so that it is the center of progress in a human-centered society, science and technology.
 - 10) *The Potential of Metaverse Technology in Education as a Transformation of Learning Media in Indonesia* (Wijayanto et al., 2023).
Review results: research shows that a metaverse technology perspective in education can provide the best digital technology to support education in Indonesia. Applying the metaverse in interactive learning media in Indonesia is divided into four types of simulation: lifetime, mirror

world, augmented reality (AR), and virtual reality (VR). Opportunities in the metaverse as a learning medium in education include immersive interactive experiences, visualization, more economical risk and cost, unlimited space, and time, preventing academic misconduct, personalization, and promotion of communication. Meanwhile, the possible challenges that will be faced are in the form of no restrictions for people involved who are lazy to move and other forms of neutral interaction.

- 11) *The Dilemma and Relief of “Metaverse + Education Archive” Informatization in China* (Chen, 2023).

Review results: “Meta-universe” is a development trend in the current era of informatization, and the transformation of real features into virtual digital information is the direction of future development of educational archives in the context of “meta-universe”. As a basic work for national education development, the informatization of educational archives has made rapid progress, but currently related research is not yet in-depth enough. In this paper, the informatization of education in the context of the metaverse is discussed, analyzes the current problems of educational archives, such as insufficient basic investment, low systematization, unbalanced and inadequate development, and proposes targeted measures, in the hope of inspiring development future. informatization of educational archives.

From the research conducted, it is clear that Metaverse can create a learning experience that is better, more inclusive, and more relevant to future demands. By understanding the potential and obstacles of using Metaverse, educators can plan the right steps to integrate this technology into modern education so as to achieve an increase in the quality of education in Indonesia.

CONCLUSION

Based on the results of literature studies conducted regarding metaverse and its challenges and opportunities in the world of education, it can be concluded that the implementation of metaverse in the world of education has a huge opportunity to support the learning process for the better. Metaverse can create learning experiences that are better, more inclusive, and more relevant to future demands. Metaverse provides a variety of benefits, including more interactive learning, effective training and development, better customer experience, enabling distance learning, enhanced learning experiences, personalization of learning, visualization of learning, Game Based learning, Role Play and Perspective taking. By understanding the potential and obstacles of using Metaverse, educators can plan appropriate steps to integrate this technology into modern education so as to achieve an increase in the quality of education in Indonesia.

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