



The Exploration of Metaverse Technology Applications as learning media in Elementary Schools

Reza Rachmadtullah, Bramianto Setiawan, Andarmadijati Abdhi Wasesa, Jatu Wahyu Wicaksono, Rasmitadila

Department of Elementary School Teacher Education, Universitas PGRI Adi Buana Surabaya, Indonesia.

Department of Elementary School Teacher Education, Universitas PGRI Adi Buana Surabaya, Indonesia. Department of Industrial Engineering, Universitas PGRI Adi Buana Surabaya, Indonesia. SD Negeri 01 Panggung, Cirebon, Indonesia

Department of Elementary School Teacher Education, Universitas Djuanda Bogor, Indonesia.

reza@unipasby.ac.id, sbramianto@unipasby.ac.id,
andarmadi@unipasby.ac.id, jatuwahyuwicaksono@ymail.com,
rasmitadila@unida.ac.id

Abstract. Recently, the development of information technology in the 21st century is growing and increasing rapidly, not the exception in the education field. The use of technology in education in elementary schools is needed for various purposes, including in learning media. This study aimed to examine the characteristics of metaverse applications that could be developed as learning media in elementary schools in Indonesia. This study used a qualitative and observation approach. Then, the data were analyzed using descriptive analysis, and the result showed a positive response about Metaverse technology as learning media. In addition, the Metaverse technology gave innovation to the teacher in the learning process, so the learning process was more interesting than before and could increase the students' learning outcomes. The existence of Metaverse Technology as a learning medium makes it easier for teachers to communicate visually and for students to find or collect information related to the material being taught.

Keywords: Metaverse; learning media, elementary students

1 Introduction

The development of technology, especially computer technology, has driven changes in all sectors of human life, almost this sector can no longer be separated from the existence of computer technology, including the education sector [24, 26, 29]. Technology is closely related to education, one of them was used as learning media. All countries must continue to follow the development of world information technology because it will also affect the quality of learning. [3, 14]. In education, technology is

used to facilitate the implementation of educational goals. Technology can be used as a learning tool or known as a digital-based learning media [2, 16, 23].

Technological developments in the current era and emerging technology media are the latest innovations, namely the metaverse [10]. Metaverse is a three-dimensional technology that allows individuals to interact with other individuals virtually. Metaverse is often interpreted as a simulation of the real world of humans implemented in cyberspace or the internet. Metaverse can be used as a medium of learning in elementary schools. In Indonesia, metaverse technology is still rarely used as a medium of learning in elementary schools, but in several elementary schools abroad, such as in the United States, Japan, South Korea, and France, this technology already has several schools that have used it. [15, 28, 33].

Exploration of metaverse technology for elementary school teachers is a breakthrough in the progress of learning quality because at this time with the development of the times, it requires teachers to be aware of the challenges that exist, especially in an era that is completely digital like today where the era is virtual and metaverse. Learning challenges will always exist along with the times, and a teacher must be able to find solutions so that existing challenges can have a positive impact (benefit value) for technological developments in education, especially in Indonesia [25]. In this technological era, there are various kinds of challenges for teachers. They must adapt their teaching methods to the needs of the 21st century learning generation by utilizing information and communication technology. In the current 4.0 education era, the role of teachers in learning is no longer required to teach so that students can solve problems in exam questions which only fill their brains. with lessons. However, a teacher must ensure that all students must be able to understand the basic concepts .

Based on data published by the World Population Review, in 2021, Indonesia was still ranked 54th out of a total of 78 countries in the world education levels [30]. This is very unfortunate because education is a pillar of a nation. According to the conditions, researchers should take the initiative to overcome the problems by applying digital and innovative-based learning media to increase student motivation and train critical thinking, logical thinking, and problem-solving skills [13, 34]. The use of Metaverse technology as learning media, especially in Indonesia, is an innovation in education. The application has a huge advantage because students can interact in the virtual world and easily receive learning materials through pictures and videos [28].

Using the Metaverse application can also support teaching staff to reconstruct real objects that cannot be seen with the naked eye [28]. In addition, the Metaverse application also allows visualization of objects that are difficult to see, such as human organs and similar objects [20]. Using the Metaverse application also makes the teaching and learning process not tied to class hours or classrooms because students can study learning materials anywhere and anytime [21].

The Metaverse application itself is a way of making learning images appear in the form of three-dimensional media or what is usually better known as 3D, where this process is made through the help of computer components so that the results will look more real and, of course with the support of several people other important tools [6]. Where this will make its users (students) feel as if they will see directly and physically in a predetermined environment, with this technology, it is hoped that the concept of

interacting in the learning process will become easier to use along with the development of smartphone technology which has an important factor in the implementation of the learning media. Even now, based on research conducted by several researchers, it is clear that only a smartphone and the help of Google Cardboard can display the world of the Metaverse [22].

The use of the Metaverse application has an immediate impact on perception because these media have the power to devoid one's perception of real space and virtual reality. In the concept of using 3D animation, this media is becoming a trend among connoisseurs of advanced technology devices because this media presents innovations that were previously difficult for humans to enjoy. The use of the Metaverse application is a technology that allows users to interact with the environment in cyberspace that is simulated by a computer so that users can feel they are in that environment. The Metaverse application is usually used with tools such as glasses called Oculus so that users can fully see the virtual environment [31].

Research studies on the metaverse as a learning medium at the education level are currently in the process of being developed in several countries. This metaverse has been used as a virtual learning tool. In Indonesia, the metaverse is being discussed and there are already several industrial companies ready to develop it, but metaverse technology as a learning medium really needs to be considered because it is considered important for the development of technology in education [8]. The urgency of this research is based on the results of a literature review of researches from several countries, so in Indonesia it is necessary to develop this metaveser because with the learning metaverse technology it can generate interest and motivation in student learning. In addition, the use of learning media metaveses can shorten space and time. In other words, metaverse as a learning medium can simplify problems related to new and unfamiliar things for students. So it can be said that the position of learning media is parallel to the learning method, because both need each other. Therefore, learning media has an urgency that is no less important in the learning process.

This study aims to find out how teachers as educators explore metaverse technology as a medium of learning in elementary schools. Because the metaverse is a new technological development in the world, the writer wants to know the responses and opinions of the teachers. Metaverse will later become a tool that helps the learning process and creates a more intense interaction between teachers and students.

2 Method

2.1 Research Design

This study aimed to determine how the perspective and readiness of teachers to the development and use Metaverse Technology as a learning media in elementary schools. This study used a qualitative and observation approach. In this study, the researcher used a qualitative descriptive type of research in the form of spoken or written words about human behavior that can be observed [5]. Qualitative data was in the form of detailed descriptions, direct quotations, and case documentation. Qualitative data is the

capture of the words of the research subjects in their language. People's experiences are explained in depth, according to the meaning of life, experiences, and social interactions of the research subjects themselves. Here the researcher conducted research by going directly to the field, describing and constructing the existing reality, and approaching the source of information, so it was hoped that the data obtained would be more accurate and maximal. The teacher's perspective and readiness are presented in the form of the NVivo 12 software node. The procedure in this study can be seen in Figure 1.

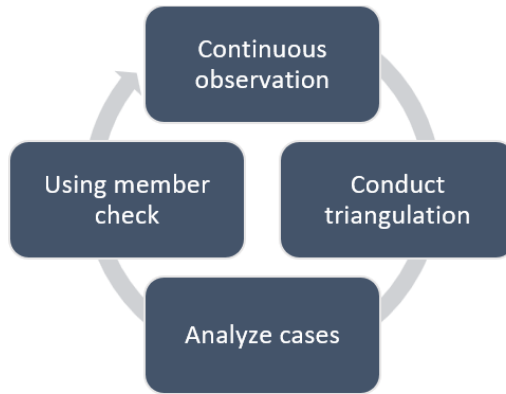


Fig. 1. The research procedure on teachers' perspectives and readiness for the development and use of Metaverse Technology as a learning medium in elementary schools

2.2 Participants

Participants in this study were 12 elementary school teachers in the city of Surabaya, consisting of three male genders (M) and nine female genders (F). The technique of determining participants in this study was using purposive sampling. The purposive sampling technique is used because of certain considerations. The sample used or taken is not based on strata, random (random), or regions but is based on a goal.

2.3 Data collection

Data Collection Techniques are the data collection tools that will have a very important role in determining the quality of research results. If this tool is not accurate, the results will not be accurate. In this research, the techniques used were as follows:

(a) In-depth interview.

An interview is a form of interpersonal communication in which two people are involved in a conversation in the form of questions and answers. One person asks questions to get information, and the other listens carefully and then gives the desired answer until the interview objectives are achieved.

(b) Observation.

Observation is a complex process composed of various biological and psychological processes, the two most important of which are the processes of observation and memory or data collection tools, which are carried out by observing and systematically recording the symptoms under study.

(c) Literature.

Literatur is a very important element in descriptive study research because without supporting literature, the research will experience many difficulties and obstacles to obtaining both theoretical and practical data. In research, they often use data from relevant research, namely research journals.

2.4 Data Analysis

Data analysis in this study used Nvivo 12 Plus. Nvivo 12 plus is a qualitative software that helps analyze data in the form of text, images, and sounds and displays them into structured results. Nvivo is a computer program for analyzing qualitative research data, as well as a tool for importing data and coding data with Nvivo [27]. The coded data can be compared with other decoded data, meaning that Nvivo is able to operate different data in one study. [1] By using Nvivo 12, it is easier for researchers and visualizing the data. The mindmap visualization of this research can be seen in Figure 2.

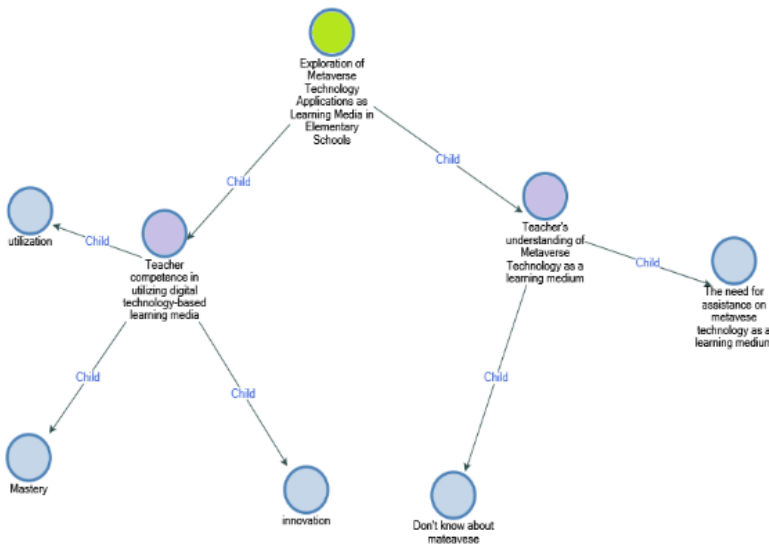


Fig. 2. The visualization of the perspective mindmap and teacher readiness for the development and use of Metaverse Technology as a learning medium in elementary schools

3 Results and Discussion

The results of this study were in the form of data taken based on respondents' answers about the perspective and readiness of teachers to the development and use of Metaverse Technology as a learning medium in elementary schools in the current era of technological development. Respondents' answers were analyzed to the Nodes created in Nvivo 12. The results obtained through the Nvivo 12 Software obtained sub-themes which include (1) Teacher knowledge about digital technology-based learning media and (2) Teacher understanding of Metaverse Technology as a learning medium.

3.1 Teacher Competence In Utilizing Digital Technology-Based Learning Media

In responding to the development and progress of ICT, teachers are required to master technology (ICT) in order to develop ICT-based learning materials and utilize ICT as a learning medium. The aim is to provide convenience and wider opportunities for students to learn. In recent years, the use of ICT in the world of education has begun to become popular in the community, starting from elementary, secondary, to tertiary education levels, despite the variations and focus of its use.

Teacher competence in utilizing ICT-based interactive learning media plays an important role in the success of learning. For this reason, a teacher must be able to utilize ICT-based interactive learning media in order to carry out quality learning. In an effort to achieve learning objectives, learning media plays a very important role. Learning media is one of the means that can help the learning process related to hearing and vision. The presence of learning media can accelerate the teaching and learning process to be effective and efficient in a conducive environment so that students can understand more quickly. With the existence of learning media, oral and written traditions in the learning process can be enriched with various learning tools. In addition, a teacher can create various classroom situations, identify learning methods to be used in various situations, and create a good atmosphere among students. In addition, learning media can help teachers bring the outside world into the classroom. Thus, abstract and unfamiliar ideas become concrete and easily understood by students. If this learning environment can be used appropriately and proportionally, the learning process will be more effective. Based on interviews with teachers (T01, T02) about their perceptions of teacher competence in utilizing ICT-based interactive learning media

Currently, we as teachers often receive training related to the development of ICT-based learning media. Because this is an important thing, the use of ICT-based learning media makes it easier for teachers to convey messages about learning materials, especially learning media that can save time (T01)

The teacher's competence in utilizing ICT-based interactive learning media needs to be mastered by the teacher, at this time, we make use of improvised technology media such as learning videos, power points, and free applications

on the internet website. As a teacher, I feel the need for parties such as universities to assist us in developing technology-based learning media or new learning media (T02).

In addition, teachers also experience obstacles in developing teacher competence in utilizing ICT-based interactive learning media. Second, the collection of assignments is not on time. The third is the lack of student response in class groups (WhatsApp) regarding online learning. Fourth, media access materials and assignments for students. Fifth, students' understanding of the material provided by the teacher. Sixth, the use of mobile phones alternately with parents. The conclusion on the theme of this research is that the competence possessed by teachers in utilizing ICT-based learning media is quite good. However, a lot of guidance is still needed in finding media and learning resources from the internet.

Learning media has an important position in a lesson plan. The learning planning process begins with the formulation of specific instructional objectives as the development of general instructional objectives. In order for learning objectives to be achieved, it is necessary to use appropriate learning aids in accordance with the characteristics of students. Learning media contains information that can be in the form of knowledge or become a means for students to carry out learning activities (reading, observing, trying, working on questions, answering questions, etc.), so learning media is closely related to learning resources. Learning resources are everything that can be used by students to facilitate the learning process so as to achieve learning goals effectively and efficiently.

The need for teacher competence in utilizing ICT-based interactive learning media is supported by Okedeyi's statement in his research stating that teachers must have expertise in the use of ICT-based learning media. Learning media is a tool used in the learning process with the intention of conveying learning messages (information). From the source or teacher to the recipient, in this case, students and allows communication between teachers and students to take place properly [12]. Messages or information conveyed through the media in the form of content or teaching materials must be received by the recipient of the message by using one or a combination of several of their senses. Teachers can pay attention to several factors that are considered in choosing media, including (1) accuracy with learning objectives, meaning that the media is selected on the basis of predetermined instructional objectives, (2) support for learning materials, meaning that learning materials are principles, concepts, and generalizations. Really need the help of media so that it is easy for students to understand, (3) the ease of obtaining media, meaning that the media is easy to obtain, (4) skills in using, (5) available time to use it, (6) according to the level of students' thinking [17–19, 29].

As one component of learning, the media cannot escape the discussion of the overall learning system. The use of media should be a part that must get the attention of learners in every learning activity [4]. But in fact, this part is still often neglected for various reasons. The reasons that often arise include limited time to make teaching preparations, difficulty in finding the right media, unavailability of funds, etc. This actually does not need to happen if every learner has equipped himself with knowledge and skills in terms of learning media. Educational media is used in the context of communication and in-

interaction between teachers and students in the learning process. By using learning media, it is hoped that students can gain real experiences so that the learning material delivered can be absorbed easily and better. The teaching and learning process is often characterized by the presence of elements of objectives, materials, methods, and tools, as well as evaluation. Methods and media are elements that cannot be separated from other learning elements [7, 32].

Based on the description above, the competencies that must be possessed by teachers in utilizing ICT-based learning media are that teachers can use information and communication technology to communicate and develop themselves, and teachers can use information communication technology in communicating. Teachers can use information and communication technology for self-development. The mindmap visualization on this theme is in figure 3.

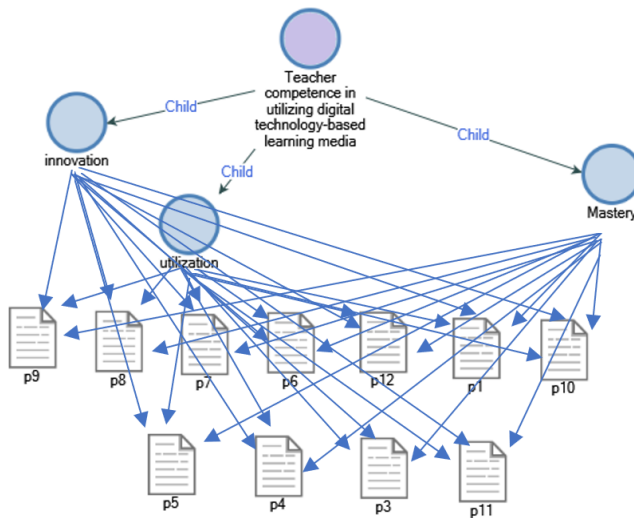


Fig. 3. The Mindmap visualization Teacher's competence in utilizing ICT-based interactive learning media

3.2 Teacher's Understanding Of Metaverse Technology As a Learning Medium

Metaverse in education is a new technology for respondents because this metaverse is still rarely used as a medium of learning in elementary schools, especially in schools where respondents work. Actually, the term metaverse is not new, this term emerged in 1992 from the novel by Neal Stephenson entitled Snow Crash. However, the technology that emerged between the elements of web 3.0, blockchain, and the virtual reality experienced its popularity when Mark Zuckerberg was keen to promote the metaverse, even changing the parent name of Facebook to Meta, last October 29, 2021. If viewed

from the opportunity, the implications of the Metaverse in the world of education will be able to present a new and challenging atmosphere in learning. The existence of this Metaverse can optimize technology and educational media that have been used today to be more effective again. In addition, the learning experience gained by the students will further assist them in stimulating the development of soft skills and fostering better self-perception in students.

The teacher's perception of metaverse as a learning medium based on the results of interviews showed that there are still many teachers who do not understand what metaverse is and how it works or uses it. Because at the time of the interview, the teacher was still not familiar with metaverse technology, the researchers conducted a focus group discussion (FGD) to introduce metaverse technology as a medium of learning in elementary schools. The researcher gives a concrete example, namely that the metaverse will one day make history teachers no longer need to take their students to museums in the real world. Students just need to be invited to enter the metaverse where a 3-dimensional virtual museum is already available. In the focus group discussion activity, the researcher asked the teachers as respondents whether they wanted to understand what the metaverse was and whether they wanted to use the metaverse. And the answers from the respondents responded positively, and all of them wanted to use metaverse as a medium of learning in elementary schools.

This metaverse technology uses a set of computers to process data, a network system to connect one computer to another as needed, and telecommunications technology is used so that data can be distributed and accessed globally. The meaning of metaverse technology for the world of education should mean the availability of channels or means that can be used to broadcast educational programs [22, 31]. The use of metaverse technology in the field of education is common. Help provide computers and networks that connect student homes with classrooms, teachers, and school administrators. Everything is connected to the Internet, and teachers are trained on personal computers. The development of metaverse technology spurs a new way of life, from life starting to ending. This kind of life is known as e-life, meaning that this life has been influenced by various needs electronically. The utilization of metaverse technology in the field of education is a must to facilitate and simplify the learning process [9, 11].

There are many benefits to be gained from Metaverse technology in an educational context. First, it can increase student engagement. Second, help students work through difficult concepts. Digital instructions help point out difficult topics that are often difficult to understand. Third, help promote critical awareness. Fourth, digital media helps promote equality. When students use digital technology in a course, all students in the class have the same opportunity to hone those digital skills. The mindmap visualization on this theme is in figure 4.

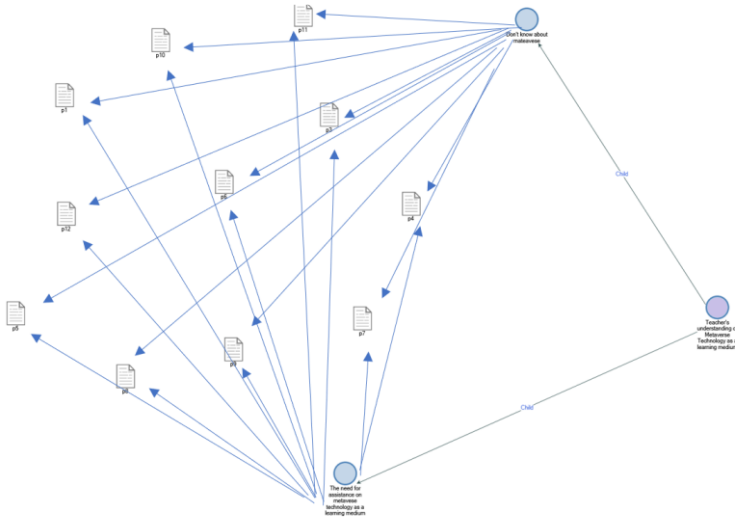


Fig. 4. Mind map visualization Teacher's understanding of Metaverse Technology as a learning medium

4 Conclusion

Teachers' perspectives and readiness for the development and use of Metaverse Technology as a learning medium in elementary schools in the current era of technological development. From the perspective of (1) Teacher's knowledge of digital technology-based learning media and (2) Teacher's understanding of Metaverse Technology as a learning medium. The use of Metaverse Technology as a learning medium in elementary schools supports the learning process and makes it easier for teachers to convey and provide understanding to students about the material being taught, besides that it can provide new experiences for students who are too saturated with conventional learning carried out by teachers, in this case, the lecture method. The optimal use of learning media in schools is largely determined by the ability and competence of teachers to manage it. The form of teacher competence/competence in managing learning media is manifested in the teacher's ability related to planning, use, improvement, and maintenance so that it is hoped that the learning process will be more varied and more meaningful for students. Learning media in elementary schools, namely starting with focus group discussion activities by providing explanations and understanding to teachers regarding metaverse as well as learning planning the use of learning media needs to pay attention to learning objectives, namely the selected media must be in accordance with the level of student development both physically and psychologically and the level of clarity media whether the media meets technical requirements such as pictures and so on.

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Statements of Conflicting Interests

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