

Implementation of Metaverse-Based Virtual Reality Technology in Archieving Subjects in Vocational High Schools

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ABSTRACT

Background: The problem that occurs to the participants is that the learning media used in the learning process is currently not up to date, so that technological updates are needed to improve the quality of learning. However, to facilitate learning through the integration of the latest technology requires various teacher competencies, namely knowledge, attitudes and skills.

Contribution: The contribution of this program is that the community service to conduct training and mentoring activities on how to develop metaversal-based virtual reality learning media to improve the quality of teachers at state vocational high school 1 Ngawi.

Method: This service is carried out through five stages of activity, including analysis of field needs, manufacture of virtual reality products, early socialization, provide assistance and evaluation of the results of using virtual reality.

Results: The result of this service activity is that the trainees understand the steps for developing learning media with virtual reality technology. This is based on the results of evaluating the achievement of training and mentoring programs involving 27 participants showing that based on the aspects of convenience, usefulness, attractiveness, and satisfaction, an average score of 92% is obtained.

Conclusion: The conclusion of this program is that the metaverse-based virtual reality learning media that was introduced to the participants was very easy to apply, useful, interesting, and the participants were satisfied with the training provided.

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INTRODUCTION

In the digital era, the order of people's lives is slowly changing [1]. Facing this, education is one part that plays an important role in improving the quality of human resources [2]. In this case the teacher plays a role in building character and increasing the professional competence of a

student. These competencies can be increased through the creativity and ability of teachers to use technology, so as to create innovative learning media [3]. Learning media are all forms of channels used to convey information in the learning process. Through this learning media, it is hoped that it can help the success of learning and maximize the learning process [4]. The requirement to be able to develop innovative teaching materials is also contained in Law Number 14 of 2005 article 20 that, in carrying out professional duties, teachers are obliged to improve and develop academic qualifications and competencies on an ongoing basis in line with developments in science, technology and art. Based on these rules it is clear that a teacher must be able to keep up with existing technological developments.

Facilitating learning through technology integration requires a variety of teacher competencies, namely knowledge, attitudes and skills. In addition, self-confidence must also always be built by a teacher to continue studying currently developing technologies. This is in line with one of the objectives of the independent curriculum at the Vocational High School Department of Office Management and Business Services, namely understanding technological developments and current issues in the field of office management and business services. Therefore, learning media plays an important role in the learning process in the Department of Office Management and Business Services, especially in the Archives Subject.

One of the media that can be used in the learning process is virtual reality (VR) technology based on Metavers. Virtual reality (VR) is a technology that combines elements of physical reality with elements of computer simulation to create virtual environments that users can access and interact with [4]. The main goal of virtual reality is to provide users with an immersive and immersive experience so that they feel as if they are in an artificial world, even though they are physically in another place [5]. VR technology works by using a VR headset equipped with a screen, lens and motion sensor [6]. This learning media is indicated to be able to increase students' interest in learning, this is because VR technology is able to provide a three-dimensional (3D) experience that resembles the real world [7]. In addition, metaversal technology also supports the concept of gamification and entertainment education which can make learning more interesting [8], [9]. Metavers-based virtual reality (VR) technology can be developed using an application called MilleaLab, which is a virtual reality platform that can be used to easily create and access 3D-based educational content without coding.

Metaverse-based Virtual Reality has been widely proposed as a breakthrough in technology that has great potential in facilitating learning [10]. Metaverse comes from the word Meta which means beyond and verse which means universe [11]. Metavers is a term used to describe virtual worlds that involve very broad and complex virtual and augmented reality. This is a concept where users can interact with a digital environment that is represented in 3D and has the ability to communicate and interact with other users in that environment [12]. In metavers, users can create digital avatars to represent themselves and explore virtual worlds designed by developers [13]. They can interact with virtual objects and environments, carry out social activities such as talking to other users, playing games, attending virtual events, buying and selling virtual goods, and participating in various digital activities and experiences.

The term "metavers" was first introduced by Neal Stephenson in his science fiction novel entitled "Snow Crash" in 1992 [14]. This concept has become increasingly relevant and has received more and more attention in recent years with the advancement of technologies such as virtual reality, augmented reality, artificial intelligence and blockchain. Major technology companies such as Facebook (with its initiative called "Facebook Horizon"), Epic Games (with Fortnite), and several others are developing metaversal platforms to create more integrated and immersive digital experiences for users.

Metavers is not a new concept in the world of education, this is because several educators and researchers have discussed its implications for the learning process. For example, a study conducted by Kemp & Livingstone (2006) which discusses how to combine metavers through the use of virtual worlds called "second life" with learning systems to improve learning objectives [15]. In addition, Collins (2008) also argues that the metaverse can be used as a further space for conducting interactive and proactive socialization for learning purposes [16]. Based on the results of previous research on the benefits of Metavers technology which can help improve the learning process, as well as the importance of the teacher's position in improving the quality of learning in this digital era, this service activity aims to socialize and assist the use of Metavers based virtual reality (VR) technology to improve quality. learning. This activity was carried out at state vocational high school 1 Ngawi.

Metaversal research for vocational education has a significant role. Metavers can be a powerful tool in preparing students for careers in various vocational fields [17]. Metavers can provide realistic simulations of complex vocational situations. In metavers, students can engage in simulations that are similar to real situations at work [18]. They can practice practical skills, deal with challenges encountered in everyday work, and develop a deeper understanding of the processes and procedures involved. In some vocational fields, access to equipment and the actual working environment may be limited or expensive [5]. Metavers can provide virtual access to expensive or complex equipment, allowing students to practice using the equipment without having to physically own it [14]. This helps improve their technical skills before entering the actual workplace. Metavers can facilitate the development of teamwork skills in a vocational context [19]. Students can work together on virtual projects, complete complex assignments, and collaborate with fellow students or professionals in a virtual environment. It helps develop communication, collaboration and leadership skills that are essential in the world of work.

Metaversal research for vocational education plays an important role in preparing students for successful careers and meeting the needs of industry. By harnessing the potential of metaverses, educators can create realistic learning experiences, enhance practical skills, and assist students in making good career decisions. The contribution of this program is that the community service team of the Faculty of Economics and Business, State University of Malang, works together with state vocational high school 1 Ngawi to conduct training and mentoring activities on how to develop metaversal-based virtual reality learning media to improve the quality of teachers at state vocational high school 1 Ngawi. The introduction of various technologies is very important to be given to schools at the Vocational School level, bearing in mind that Vocational School is a secondary education level that prioritizes the development of students' abilities to do various specific jobs. For this reason, provision of mastery of technology is an important point that must be given to students, this is so that students after graduation are ready to enter the world of work which in fact has taken advantage of various technological developments.

METHOD

This community service implementation method consists of 5 stages. The main focus of these activities is the preparation of science and technology that will be applied to the community. The stages of community service consist of 1) field needs analysis; 2) manufacture of virtual reality products; 3) initial socialization of the results of the design based on the results of the needs analysis; 4) provide assistance and education to participants, namely pre-training assistance, training period, post-training, up to the mentoring stage when determining the use

of virtual reality; 5) evaluation of the results of using virtual reality in metaversal-based archiving subjects. the implementation method will be explained in Figure 1 as follows.

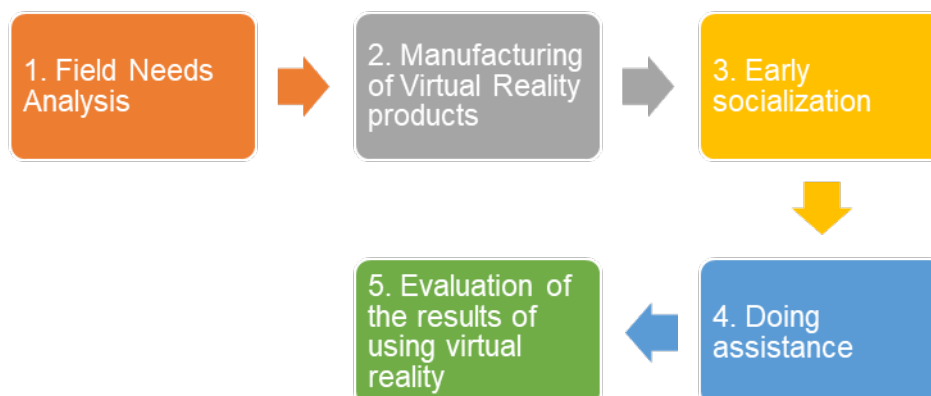


Figure 1. Implementation method

As for knowing the results of virtual reality training and mentoring, it can be seen based on the results of the analysis of the questionnaire distributed to the training participants, after the participants developed metaverse-based virtual reality learning media. The assessment indicators consist of several aspects including:

- a. Aspects of convenience.
- b. Aspects of usefulness.
- c. Aspect of attractiveness.
- d. Satisfaction aspect.

The data processing formula used is as follows:

$$P = \frac{X}{Xi} \times 100\% \quad (1)$$

Information:

- P = Percentage of results of training participants
 X = Total score answers by trainees
 Xi = The maximum number of answers in the assessment aspect
 100% = Constant

The training and mentoring activities were declared successful with the following criteria:

- a. 75%-100% = The metaverse-based virtual reality learning media that was introduced to teachers was very easy to apply, useful, interesting, and partners were satisfied with the training provided so that the service program was declared successful.
- b. 50%-74% = The metaverse-based virtual reality learning media that was introduced to teachers was difficult to apply, but useful, interesting and the partners were quite satisfied with the training provided so that the community service program needed to be improved again.
- c. 1%-49% = Metaverse-based virtual reality learning media that were introduced to teachers were difficult to apply, less useful, less attractive, and partners were dissatisfied with the training provided so that the service program was declared unsuccessful and needed another program.

RESULTS AND DISCUSSION

This training and mentoring activity was carried out at state vocational high school 1 Ngawi, East Java on May 25 2023. Prior to carrying out the training and mentoring activities, the community service team also conducted a pre-training visit to carry out field needs analysis activities. The number of participants in the training activity amounted to 27 participants. The series of activities in this community service activity include:

1. Field Needs Analysis

At this stage, the community service team analyzes the condition of the prospective trainees. Needs analysis is carried out by analyzing the experiences, situations and emotional conditions of prospective trainees as virtual reality users. This is very important to do in order to place the developer on the side of the user so they can understand the user's condition through customer discovery, observation, and other methods. The results of the needs analysis are used by the community service team to help prepare training programs according to needs.

Based on the results of the field needs analysis, information was obtained that prospective trainees were accustomed to using technology in learning, such as using power points for media presentations and video shows to strengthen students' understanding. However, the media is felt to be less up to date along with technological developments. So that teachers of state vocational high school 1 Ngawi as potential trainees need updated technology that can be used in the learning process. In addition, prospective trainees also said that the desired technology is technology that can increase students' interest in learning.

Through these analytical activities, the community service team seeks to provide solutions by conducting literature studies from various journals. Based on the results of the situation analysis and literature study, the community service team found a solution by implementing metaverse-based virtual reality technology in learning, namely a digital technology that can display virtual worlds in three dimensions (3D) based on virtual reality technology.

Basically, prospective trainees are someone who is literate about technology. They realize that mastery of technology is very important for a teacher to improve the quality of learning. So that prospective trainees are people who want to learn and develop their abilities in the field of learning technology. Based on the results of the initial analysis it was also known that after the community service team obtained a solution by presenting virtual reality, the activity participants also stated that they had used this technology, but in this case they only played a role as users. So that prospective trainees want to be given training on how to develop these learning media. In addition, prospective training participants also want an example of the results of virtual reality product development, especially in office productive subjects. So that archiving subjects were chosen because they are productive subjects that must be mastered by students.

2. Manufacturing of Virtual Reality Products

The second stage of this community service activity is to develop a product using the MilleaLab application. The output of the media development is in the form of virtual reality learning media for archival subjects. In addition, the service team also prepared steps for using the MilleaLab application which is used as a development guide for prospective trainees. Millealab is a cloud-based technology that supports the creation of 3D and virtual reality-based learning content anywhere and anytime without coding. This application can operate on smartphone devices with the Android operating system type. The steps for using the MilleaLab application in general are as follows. Akses trial version from <https://millealab.com/startrial>

- Fill in the blanks, especially the email column, because Millealab will send a download link for the Millealab Creator application and viewer to that email.
- Download Millealab Creator on PC and install Millealab Viewer on smartphone.
- After downloading, install the application by clicking Millealab.exe then follow the instructions until it works.
- When activating Millealab Creator, wait for all processes to finish until they open
- Then the Millealab Creator application is ready to use.

The menus on Millealab Creator include:

- Scene, contains gallery save, classroom and application exit.
- Edit, contains how to edit the scene, namely undo, redo, duplicate, delete, move, rotate and scale.
- View, contains a view of the scene from above, below, front, back, etc.
- Submission *Beta, contains how to upload 3D assets or skyboxes that have been made
- Settings, contains how to set the language and auto save the scene
- Help, contains shortcut information, application version, FAQ, and Millealab Viewer link information.

The following is the initial appearance of MilleaLab shown in [Figure 2](#).



Figure 2. MilleaLab application for product development

3. Early Socialization of Virtual Reality

After the media was developed, the service team conducted an initial outreach regarding the benefits of virtual reality in learning. The benefits of learning using virtual reality are to increase students' enthusiasm for learning and curiosity, encourage students to think creatively, and increase students' exploration power. Apart from that, at this early stage the service team also explained the steps for use, the need for tools, costs, and introduced the MilleaLab application to develop virtual reality. Use of virtual reality tools shown in [Figure 3](#).



Figure 3. Use of virtual reality tools

4. Assistance in the Use of Virtual Reality

At this stage the service team displays the results of virtual reality product development on archival subjects. Then proceed with providing assistance in making projects in groups through the use of the MilleaLab application, while the material projects developed focus on productive office subjects, including those related to correspondence, petty cash, public relations, infrastructure, and staffing. The activity took place actively where the participants conducted questions and answers when the project making activity took place. The questions raised included those related to device specifications for developing learning media with MilleaLab; safety of virtual reality learning media when applied in the learning process; obstacles that may occur when implementing virtual reality media in learning and discussions regarding how the features in the MilleaLab application work. These questions were immediately answered by the service team, so that the training and mentoring activities took place interactively. Virtual reality learning media in archival subjects shown in Figure 4.



Figure 4. Virtual reality learning media in archival subjects

5. Evaluation of the Results of Using Virtual Reality

This training activity ends with an evaluation to determine the extent to which the training and mentoring program has been achieved. In this mentoring activity the service team distributed 27 questionnaires to be filled out by the training participants, in order to find out the achievement of the results of the service. The results of the training and mentoring activities are presented in Table 1.

Table 1. The results of the dedication evaluation

No	Rated Aspect	Score that Obtained (x)	Ideal Score (xi)
A. Convenience			
1	The media taught to trainees is easy to learn and apply in the learning process	125	135
2	Instructions for use are easily understood by trainees	123	135
3	Learning media taught to trainees can be adapted to other subjects.	124	135
4	The menu in the application that is introduced to the trainees is easy to understand its use and application.	123	135
B. Usefulness			
5	The training provided to participants is useful for improving the quality of classroom learning	124	135
6	Learning media taught to trainees can clarify the meaning or meaning of the material being taught	125	135
7	Learning media taught to trainees can be applied to the learning process	124	135
8	An example of developing archival learning media by utilizing virtual reality is useful for helping students understand archival material	125	135
C. Attractiveness			
9	Learning media introduced to training participants can increase student learning interest.	123	135
10	The examples given by the service team helped trainees to develop other learning media.	125	135
11	Learning media that are introduced are interesting for further study.	125	135
D. Satisfaction			
12	The presentation of the material by the service team is presented clearly and easily understood.	122	135
13	The language used in the training is easy to understand.	124	135
14	The material provided is in accordance with the needs of the training participants.	123	135
15	Training and mentoring activities carried out according to partners' expectations	124	135
Amount		1.859	2.025

Source: Results of completing the training participant questionnaire, 2023

Percentage

$$= \frac{x}{xi} \times 100\%$$

$$= \frac{1.859}{2.025} \times 100\%$$

$$= 92\%$$

Based on the evaluation results, a value of more than 75% was obtained, which means that the metaverse-based virtual reality learning media that was introduced to teachers was very easy to apply, useful, interesting, and participants were satisfied with the training provided so that the service program was declared successful and received high enthusiasm from participants training. The results of filling out the questionnaire by the training participants on various aspects can be seen [Figure 5](#).



Figure 5. Graph of the results of the achievement of the training program

Research on the technology metaverse in vocational schools can cover several relevant aspects. Integration of the Metaverse in the Education Curriculum focuses on how to integrate elements of the metaverse into the educational curriculum in vocational schools. For example, how metaverse technologies such as virtual reality (VR) and augmented reality (AR) can be used to enhance students' learning experiences in fields such as graphic design, engineering, or industrial simulation. In addition, it can also be applied through the development of metaverse applications for practical learning. For example, how to use metaverse technology to build virtual environments that allow students to practice in simulated situations similar to the real world. This can help students hone their practical skills before interacting directly with actual equipment or machines [20]. This research can explore how to connect the metaverse world with the industrial world in the vocational field. For example, how to develop a metaverse platform that allows students to collaborate with industry professionals, participate in industry projects, or even do virtual internships in companies. This can help students gain valuable practical experience and prepare them for the real world of work. Besides that, it can also focus on measuring the effectiveness of using metaverse technology in learning in vocational schools. This can be done by comparing the learning outcomes of students who use metaverse with students who use traditional learning methods. This can involve measuring skill improvement, understanding of concepts, or motivation to learn.

The Metaverse scenario in Vocational Schools can be applied in several ways, including through interactive learning [21]. Vocational schools create virtual spaces in the metaverse that mimic work environments in various industries. Students can enter this space using their avatar and interact with the machines, tools, and technology used in everyday work. They can test practical skills in real-time, conduct experiments, and face real-world challenges. In addition, metaverse scenarios can also be carried out through emergency situation simulations [22]. Metaverse provides a platform to train students in dealing with emergency situations that may occur in the workplace. Using realistic 3D simulations, students can learn about safety, fire fighting or emergency evacuation procedures in hands-on practice without any real risk. This helps increase their understanding of safety protocols and reduces potential workplace risks. Through the metaverse, students can also virtually visit factories, companies or other work

locations [23]. They can observe the production process, take virtual tours, and get hands-on insights about a particular industry without having to leave the classroom. This helps students understand their work context better and inspires them to explore different career paths.

Technological developments are unstoppable at this time, making training with the theme of technology highly sought after by trainees, especially teachers [24]. This is bearing in mind that to increase the professionalism of a teacher one of which is the mastery of technology to improve the quality of learning in the classroom [25]. This is supported by several trainings that have been carried out to date, which show that the training with the theme of learning technology innovation was well received by the participants [26], [27]. This is because the teachers realize that the students being taught today are digital natives who use smartphones more for their daily activities [28]. So that learning by utilizing technology will increase students' interest in learning [29]. Especially with the presence of virtual reality technology that can encourage students' curiosity because they can experience experiences that are difficult to do in the real world [4], [30]. In addition, specifically virtual reality allows the merging and layering of real objects and virtual objects with the information you want to convey.

CONCLUSION

Learning media are all forms of channels used to convey information in the learning process. Through the application of this learning media, the learning objectives can be achieved optimally. The importance of implementing learning media in supporting the learning process, the purpose of this service activity is to socialize and assist the use of Metavers-based virtual reality (VR) technology to improve the quality of learning. Virtual reality (VR) is a technology that combines elements of physical reality with elements of computer simulation to create virtual environments that users can access and interact with. Metaversal-based Virtual Reality has been widely proposed as a breakthrough in technology that has great potential in facilitating learning. Metavers is a term used to describe virtual worlds that involve very broad and complex virtual and augmented reality. This is a concept where users can interact with a digital environment that is represented in 3D and has the ability to communicate and interact with other users in that environment.

Service activities are divided into five stages of activity, including 1) analysis of field needs; 2) manufacture of virtual reality products; 3) early socialization; 4) Provide assistance; 5) evaluation of the results of using virtual reality. This community service activity was carried out at state vocational high school 1 Ngawi. The application used to develop virtual reality learning media is the MilleaLab application, which is a virtual reality platform that can be used to easily create and access 3D-based educational content without coding. Based on the evaluation results of completing the questionnaire by the training participants, an assessment result of 92% was obtained, this means that the metaverse-based virtual reality learning media that was introduced to the participants was very easy to apply, useful, interesting, and the participants were satisfied with the training provided.

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