



The use of metaverse technology as a learning model for virtual reality-based industrial control engineering course

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ABSTRACT

Virtual Reality (VR) is a computer technology that creates a digital simulation that allows users to interact and feel as if they are in an environment that exists in the virtual world. This study aims to investigate the use of metaverse technology as a learning model. The research was conducted using the research and development (R&D) method. In learning, virtual reality media is used as a supplement to teaching materials for industrial control engineering courses. The results of the product feasibility test conducted on media experts, material experts, and students received many positive responses, so it can be concluded that this virtual reality media is suitable for learning. This media makes it easy for students to learn industrial control engineering and provides attractiveness for students, increasing their curiosity to learn.

Keywords: Metaverse; virtual reality; learning media

1. INTRODUCTION (12pt)

Digitalization certainly brings new opportunities in learning innovation for vocational education. Digitalization in education can be seen through digital learning, e-learning, online courses, e-books, and academic information systems. At the higher education level, digital learning is a form of educational disruption that can fundamentally change the learning process. Therefore, for graduates to be more competitive, the curriculum in vocational education needs a new orientation that leads to digital learning.

The utilization of digital technology into the learning process certainly facilitates students in fulfilling their needs in seeking knowledge. The existence of digital technology makes education experience a shift, namely from conventional models to more flexible and modern education. One of the latest digital era education trends is paperless, where all processes that use paper in the current era are changing to digital data storage in the form of electronic files and converting them to e-books. Therefore, seeing the rapid development of times like this, educators are indeed very much expected to contribute in giving birth to a generation that can compete in this industrial era 4.0.

Metaverse technology is one of the digital technologies that can be used in learning. It offers a more tangible, interactive, and three-dimensional view, creating an engaging learning environment. Metaverse technology is currently the topic of much discussion. Metaverse is a digital technology that uses Augmented Reality (AR) and Virtual Reality (VR) to create a 3D virtual world where users can be seen interacting in a real virtual world.

These technologies are limited to artificial intelligence, personalized learning, and gamification. The use of metaverse technology should be applied to a broader scope. Learning models have a broader scope than learning strategies, methods, or procedures. By implementing metaverse technology into a learning model, the learning carried out has its characteristics with a digital-based and post-pandemic learning approach. It can reduce physical meetings in the real world, but virtually does not reduce the essence of learning. Metaverse makes it possible to design new experiences that transcend time and space. Metaverse-based education allows the use of unlimited space and data and has the advantage of allowing interaction at the level of face-to-face education (Iswanto et al., 2022).

Virtual Reality (VR) is a technology that allows users to enter and interact with virtual worlds because VR is a computer technology that combines particular input and output devices to allow users to interact deeply with virtual environments. Just like in the real world (Musril et al., 2020). According to Ariatama et al. (2021), VR technology is an opportunity to display learning images as three-dimensional or 3D media in general, where this process is carried out with computer components so that the results are more accurate and authentic with the support of the course. Other big problems with specific devices.

VR technology has evolved and utilized on various platforms, such as smartphones. Of course, smartphones have a feature called Mobile Apps or application tools that allow users to download various applications or stream from YouTube for free. According to Abdillah et al., (2018), virtual reality technology is assumed to be a pioneer

of technological developments that help the learning process in the form of a new and current learning environment and can overcome learning problems.

Virtual reality is the appearance of three-dimensional images that are computer-generated to look real with the help of several pieces of equipment, making the user feel physically involved in the environment (Moura, 2017). Virtual Reality requires devices designed for specific purposes in this technology to make people who experience the virtual world fooled and convinced that what they are experiencing is real.

2. METHODS

This research is a research and development. Research and development (R & D) is research that aims to produce a new product and test the effectiveness of the product. The research and Development (R&D) method is used, where the subjects of this study are students of Politeknik Bosowa. The topic taught is Industrial Control Techniques. The final product of this research is industrial control learning model based on Virtual reality, which valid criteria. The stages of developing this model include the following steps.

Pre-Development

Pre-Development is using stage by collecting learning information data using descriptive analysis, observation, and documentation of lecture results at polytechnics. The aspects observed include lecture implementation, student characteristics, and the required learning model.

Development

Development is done by compiling a learning model design and developing learning tools. The goal in compiling the learning model design includes aspects, namely learning objectives and learning outcomes of industrial control techniques. Furthermore, the design of this learning model was consulted and validated by a team of experts.

3. RESULTS AND DISCUSSION

Results

In its application, a 3D object will be created that will display industrial control equipment then after the 3D object has been created, the user will need additional devices, namely Google Cardboard VR glasses to help users to enter and interact directly in the 3D world. The following stages of virtual reality application design can be seen. as follows:



Figure 1. Application Design



Figure 2. Implementation of VR in Classroom

Discussion

Validation Results of Industrial Control Learning Model Based on Virtual Reality

Table 1. Recapitulation of Validity Results

No.	Komponen	Validation Score			Average	Category
		V1	V2	V3		
1	Control Industry VR Model	3,15	3,18	3,25	3,19	Valid
2	Learning Plan	3,51	3,43	3,45	3,46	Very Valid
3	Manual Book	3,00	3,23	3,25	3,16	Valid
4	Application VR	3,35	3,43	3,54	3,44	Very Valid
5	The Assessment Sheet	3,34	3,43	3,32	3,36	Very Valid
Average Validator Rating					3,32	Very Valid

Based on the evaluation of the three validators on the industrial control augmented reality model component, an average of 3.19 was obtained with the valid category. The learning plan component obtained a value of 3.46 in the very valid category. The manual book component obtained an average value of 3.16 with the valid category. The component application augmented reality obtained an average value of 3.44 with the very valid category. While the assessment sheet component obtained an average value of 3.36 with the very valid category. So that the overall average for the assessment of the validation of the learning model obtained a value of 3.32 in the very valid category.

4. CONCLUSION

Based on the results and discussion of the study, it can be concluded that: (1) the industrial control learning model based on augmented reality at the polytechnic based on the validators assessment obtained an average of 3.32 with a very valid category. Thus the learning model that has been developed can be applied in polytechnics; (2) the industrial control learning model is effectively used to increase knowledge of industrial control techniques.

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