


Virtual Reality Learning Electronics Laboratory

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ABSTRACT

The changes hitting the world in the 21st century have entered the era of the industrial revolution 4.0. The education sector also will be disrupted from the revolutionary era. The problems of various human activities in the education aspect, such as ethics, will more or less affect the culture, direction, and progress of an organization. And the era of disruption can be seen from the development of information technology as a basis in human life. Many things have changed and become borderless with unlimited computing power and data use. Seeing the gap in the shift in national education, the Ministry of Education and Culture launched the Independent Learning Campus policy. Universities are expected to be able to answer the challenges of the Industrial 4.0 era through curriculum development by aligning technological literacy skills and human literacy. The method used is the Mix Method, qualitative and quantitative

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1. INTRODUCTION

Politeknik Negeri Medan is a vocational education in Sumatra Island that is currently implementing the MBKM policy through curriculum development in each of its study programs. Politeknik Negeri Medan consists of various study programs including commerce and engineering. One of the study programs is the D-III electronics under the Department of Electrical Engineering. This study program also realizes cross-literacy between technological literacy and human literacy.

The technological literacy implemented is the use of Virtual Reality interacting in an artificial environment in a virtual world designed using a computer, commonly called Politeknik Negeri Medan Virtual Reality.

Virtual Reality is 3-dimensional digital media such as multisensory, immersive, and interactive environments that will trigger people's imagination as a future technology that controls various fields involving education, recreation, and others (Gonizzi Barsanti et al., 2015). Progress in virtual education with the 360-degree panoramic (VRP) technique is still minimum at Politeknik Negeri Medan.

In this study, the research team will examine the design of using VR in the laboratory learning of the Electronics study program to support the superior technology-based learning process, including human literacy through the embodiment of ethical values, superior organizational, and local culture.

2. RESEARCH METHOD

2.1 Method

The mix method is applied to collect and process qualitative and quantitative data. This study surveyed students in the electronics lab learning majoring in Electrical Engineering to obtain their perception of the Electronics Lab Machine used as the research object. The data obtained were used as input for the basic concept of designing VR-based digital content. While qualitatively, the results of literature data, observations, and interviews become a reference in VR-based design.

2.2 Research Flowchart



Figure 1. Research Flowchart

3. RESULTS AND DISCUSSION

The Multi Pignat Control System is an instrumentation simulator and control system using water as the operating and testing medium for the Multi Pignat Control System. This Multi Pignat control system is a simulator of the Power Plant process that can be water distillation, oil and gas exploration, and palm oil processing simulator. This device consists of:

1. Sensors-measuring devices such as flow, pressure, temperature, density, level, volume, speed, and acceleration.
2. AC motor connected to a Compressor Machine help circulate the water media, filter water and drain and process the refinery – cooling system.
3. The device systematics includes industrial electronic devices, namely the latest state-of-the-art measurement devices such as flow and pressure meters connected automatically.
4. The courses featured in this device are: Control System, Instrumentation, Measurement, Sensors and Transducers, PLC, DCS and SCADA (Monitoring Control), HMI Interface, Digital Electronics, Basic Electronics, Electrical Circuits, Electrical Power Engineering, Electrical Mechanical, Mechatronics, Physics and Computing Programming, and Signal Processes and Systems and Thermodynamics.
5. The most vital thing is that this device can and is capable of being a simulator of an intelligent control system or automation and as an analysis of a manufacturer's process, being the basis and similarity or adaptation for students to know the processing process of a media in the industry.

3.1 Production

This stage of production is the stage that aims to make products from raw materials become finished products and are ready to be tested. At the production stage, there are two activities carried out. The first production is the process of taking 360-degree photos for VR needs. There are 4-8 points in one room where the photos are taken. These 360 photos are further processed in the post-production stage to make them visible in VR. This VR photo was made using a GoPro 3600 camera.



Figure 3 Learning Process

The video recording process is the explanation of the practical learning of practical tools in the Electronics laboratory. The recording is done directly with conditions such as the learning process in general. There are lecturers, and there are also



Figure 4 Production Stages

students in small groups attend the lesson. The specifications of the equipment used are the Sony A7 II camera with Full HD video quality equipped with a microphone. Technical video recording is direct without pause and produces approximately 20 minutes.

This research was conducted at two Electronics laboratories in the Z building and the Electronics Workshop, Politeknik Negeri Medan. There are several machines used as material for study using Virtual Reality technology and learning videos. The first line of research carried out is that the researcher observes and observes the room to determine the initial view of the Virtual Reality camera device for taking 360o photos.

3.1 360° Post Production

In this section, the researcher uses a free website-based application for managing VR photos taken previously. It is a website-based tool for managing VR photos before they are uploaded to the site and enjoyed. The tools on this site are free. However, the basic features can already meet the needs.

Next, it is directed to upload or select 360 photo files taken at the production stage, which we then turn into Virtual Reality. Because there are several tools in one room in the Electronics Laboratory, the researchers included several photos to be connected so that virtual reality dynamics can be achieved more.

Next, it is directed to upload or select 360 photo files taken at the production stage, which later turn into Virtual Reality. Since there are several tools in one room, the researcher uploaded four photos used as initial views. After creating/setting the initial view, the next step is to create

1. Hotspot Info
2. Hotspot point link
3. Export to zipping

The results of the export zip from this application will then be brought and uploaded to the website whose domain has been created.

3.2 360° Video Post Production

From the results of the production of learning recording video material that has been carried out, the research team then carried out the video editing stage. Post Production uses Adobe Premiere Pro CC 2019 software. The stages carried out at this stage include:



1. Cutting & removing; Removing parts of the footage that are useless, sound leaked or accidentally recorded.
2. Provide video transition effects at the beginning and end of the video.
3. Gives an audio gain effect at the end of the video, so that it stops gently (smooth).
4. Export/ Rendering & compressing into the desired file and size.
5. Upload on youtube.

The final step after completing the Post Production process is to display it on the website as part of the research output publication.

4. Conclusion




Embedding renewable technology in learning is an indicator of adapting to the times and needs. Virtual Reality, one of the technologies embedded in the development of learning media, was applied in this research. Virtual Reality in this study can be counted as a face display or virtual packaging of one of the Electronic Laboratory learning processes. Virtual Reality displayed on the website is a learning material helping during the COVID-19 pandemic and distance learning. The correlation of information and visualization of practical learning type in the laboratory is conveyed clearly through VR and the website. Through Virtual Reality, viewers can get and feel the experience of being in place before an offline presence. This research suggests that the laboratory learning process needs equipping with multimedia technology such as Virtual Reality, Audio Visual, and experimentation on the media used. The optimal use of VR technology is highly expected to be disseminated outside the study program but in other study programs or majors.

REFERENCES

- Anthes, C., García-Hernández, R. J., Wiedemann, M., & Kranzlmüller, D. (2016). State of the art of Virtual Reality technology. IEEE Aerospace Conference Proceedings, 2016-June. <https://doi.org/10.1109/AERO.2016.7500674>
- Arsyad, A. (2013). Media Pembelajaran. Jakarta: PT Rajagrafindo Persada.

Gonizzi Barsanti, S., Caruso, G., Micoli, L. L., Covarrubias Rodriguez, M., & Guidi, G. (2015). 3D visualization of cultural heritage artefacts with Virtual Reality devices. *International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences - ISPRS Archives*, 40(5W7), 165–172. <https://doi.org/10.5194/isprsarchives-XL-5-W7-165-2015>

BIOGRAPHIES OF AUTHORS

	<p>Her Name is Yuvina. she was Born in Asahan, October 18, 1967. Until Now, She teaches courses on measuring and measuring instruments, Analog Electronics, and Industrial Electronics.</p>
	<p>His name is Rezha Destiadi, He was born in Jakarta, December 4, 1988. His pen name is @rezhaban. He is the second of 3 children. As a child, he had a passion for football. However, the athlete's future that was not too bright was the reason my mother held back her dream. In fact, now he has served as an athlete in education. He continues to relay in conveying the baton of knowledge to many people. The second hobby, photography, also has a big influence to this day. He has hope for his future so that his ability as an athlete in education will be even more brilliant. Also as a coach so that more and more educational athletes are born and fight for their country.</p>
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