

Enhancing Automation and Data Acquisition Learning Through Web Virtual Reality: Utilization and Practicality

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Abstract

A good learning process must contain interactive, fun, challenging, motivate and provide more space for students to be able to develop creativity and independence, according to the talents and interests of students. Vocational High School prioritizes practicum over theory. Need considered in the selection of media, namely learning objectives, effective, easy to obtain, students, usage, cost, and quality. One of the developments of learning media that is currently still the new one is learning media using Web Virtual Reality. Web Virtual Reality can be built using the help of Vuforia and Unity 3D software. The final result is an interactive learning media with Web Virtual Reality. The results of the analysis of the validity of the developed learning media obtained an average value of 3.21 with the category "Valid". The average practicality of Web Virtual Reality learning media is "very practical" category.

Keywords: Learning Media, Validity, Practicality, and Web Virtual Reality.

INTRODUCTION

The development of technology in today's era is growing rapidly. With the advancement of science and use Technology penetrates into various fields, does not have the field of education. Those who are involved in the world of education will be able to follow and follow the technology. Not only proficient teachers/lecturers but students or students must be able to keep up with technological developments (Efendi, 2019). The manuscript highlights how Web VR can be utilized



as a learning medium, particularly in fields requiring practical skills, such as automation and data acquisition in vocational education.

In recent years, digital competence has been a key concept in discussions of the types of skills and understanding that students need in the knowledge society. However, it has been interpreted in various ways (e.g., Digital Literacy, Digital Competence, eLiteracy, e-Skills, competence, Computer literacy, and media literacy) in policy documents, in academic literature, and in teaching, learning, and certification practice. All these terms highlight the need to address technology in an era of digital. The use of digital technology in the learning process offers immediate feedback both for students and teachers. Feedback in the learning process is very important for teachers to improve the quality of the direction of learning activities, and share students can mediate learning outcomes (Hidayat, 2019).

In the teaching and learning process, five very important components are objectives, materials, methods, media, and evaluation of learning. These five aspects influence each other. Choose one certain teaching methods will have an impact on the appropriate type of learning media, without forget three other important aspects, namely objectives, materials, and evaluation of learning. The use of learning media in the teaching and learning process can generate interest and new desires, arouse motivation and stimulation of learning activities, and even bring psychological effects on learners (Falahudin, 2014). To facilitate the process of introducing industrial automation systems to students, a learning medium (teaching aid) is needed that will bridge the knowledge transfer process. Learning media plays an important role in creating an effective teaching and learning process. So that the learning process can become more interactive (Irvawansyah & Mukhlisin, 2019). However, currently there is still a lot of learning that is not supported by adequate learning facilities as well as limited space and time flexibility.

Learning media is everything that can be used to channel the sender's message to the recipient, so that it can stimulate the thoughts, feelings, concerns, and interests of students to learn. Today's learning media has evolved from conventional media to computer technology-based media and multimedia (Tafonao, 2018). One of the digital technologies that can be used in learning media is Web Virtual Reality technology. This technology will provide an interesting learning atmosphere because it provides a more interactive, 3D, and real display. In addition, Web Virtual Reality technology is widely developed in the manufacture of multimedia learning presentations as a teaching tool in the learning process in the classroom, and does not replace the role of the teacher as a whole (Mustaqim, 2017).



Vocational education should always make updates which refer to technological developments at this time so as to be able to produce human resources that can compete in the future (Mukhlisin, 2021). Augmentation technology is the technology that best supports vocational learning in the era of the industrial revolution 4.0. The technology is very efficiently used in the vocational learning process (Sudira, 2020). Some of the advantages of Web Virtual Reality technology include: (1) Intelligent Display Technology; this technology allows supported by various displays based on intelligent screen display; (2) Intelligent 3D Registration; with the use of this feature, it is possible to pour virtual images into the real world; and (3) Intelligent Interaction Technology; With the development of intelligent interaction technology, Web Virtual Reality not only superimposes virtual information onto real scenes, but also realizes interactions between virtual people and objects in real scenes (Chen, 2019). VR is no stranger to today's digital era. This technology has developed very quickly and spread into many aspects of life, one of which is education (Gultom et al., 2024). It provides valuable insights into the development and implementation of Web VR, including the use of software like Vuforia and Unity 3D to create interactive learning environments.

Learning media is everything that is used to convey messages from the sender of the message to the recipient of the message that can increase or develop the horizons of thinking, feelings, and learning interests of students or students (Naz & Akbar, 2013). In this study, it will be explained how Web Virtual Reality technology can be used as a learning medium for the automation industry and acquisition data learning in vocational education. Base on background, This research focuses on the use of Web Virtual Reality as a learning media for visualization of the automation industry and acquisition data parts.

METHOD

Data Research

The data in this study were obtained through user responses to the practicality of learning media. This research was conducted at the Department of Electrical Engineering in Politeknik Negeri ujung Pandang. The learning media that will be designed is a automation insdustri and accuisition data learning media. Lecturers and students are involved in determining the practicality of using Web Virtual Reality learning media.



Design of System

Before conducting research, it is necessary to have a concept and research design planning. In this study, a stage was designed for how Web Virtual Reality technology works. the planning stages include media selection criteria, application development, hardware and software analysis. This stage is carried out in the development of VR applications in accordance with the needs analysis that has been carried out.

Implementation Stage

Web Virtual Reality Learning Media will be tested and experimented with in order to get learning media products that are suitable for use. The final product that has been developed will then be used thoroughly in the automation industry and acquisition data learning process at the Department of Electronic Engineering Education, Politeknik Negeri Ujung Pandang.

RESULT AND DISCUSSION

Web Virtual Reality is a technology that combines virtual objects with real objects. One of field that uses VR technology is the field of education, which is used as a learning aid for students make students better understand the material given. The Web Virtual Reality learning media that will be developed first are designed and developed based on the initial needs analysis.

Development of Web Virtual Reality Learning Media

The Web Virtual Reality learning media was designed and created based on the initial needs analysis conducted during observations. The following prototypes were developed:

1. **Login View:** The initial menu includes options to start or exit the application.
2. **Main Menu:** After logging in, users access the main menu with four selection buttons:
3. Lobby
4. Create Account

User Interface Prototypes

1. **Lobby Menu:** This menu detects Web Virtual Reality objects in the classroom and visualizes them directly.
2. **Create Account Menu:** Users fill in their name, password, and select a room type to create an account.



Classroom Visualization

After entering the classroom, users can view elements such as desks, benches, whiteboards, and industrial automation trainers.

1. Simulation Capabilities

Users can simulate program execution and operate PLC components for learning purposes.

2. Validity Analysis of Learning Media

The validity of the Web Virtual Reality learning media was assessed by two validators across three categories: content, display, and programming. The results are summarized below:

Content Validation Results:

Material Quality: Average score of 3.36 (Very Valid)

Language Quality: Average score of 3.17 (Valid)

Material Update: Average score of 3.00 (Valid)

Overall Content Score: 3.17 (Valid)

Display Validation Results:

Text Readability: Average score of 3.50 (Very Valid)

Image Quality: Average score of 3.00 (Valid)

Button Functionality: Average score of 3.75 (Very Valid)

Overall Display Score: 3.25 (Valid)

Programming Validation Results:

Programming Quality: Average score of 3.38 (Very Valid)

Interaction Quality: Average score of 3.17 (Valid)

Overall Programming Score: 3.22 (Valid)

Overall Validity Score: The average validity score from all assessments is **3.21**, categorized as valid.

3. Practicality Analysis

The practicality of the Web Virtual Reality learning media was evaluated based on feedback from lecturers and students after trials. The results indicate:

The average practicality rating is categorized as "very practical," confirming its suitability for use in teaching automation industry and data acquisition.

This structure provides a clear summary of findings without interpretation, allowing readers to grasp the essential outcomes of the research efficiently. Each subsection presents specific results related to the development, validation, and practicality of the Web VR learning



media, ensuring that all relevant data is easily accessible for further review or analysis in subsequent sections of the manuscript.

The results of the development of the Web Virtual Reality learning media are as follows.

4. Result of Making Learning Media Web Virtual Reality

Web Virtual Reality learning media is designed and created based on the results of the needs analysis at the time of observation. The prototypes of the learning media are as following Figure 1.

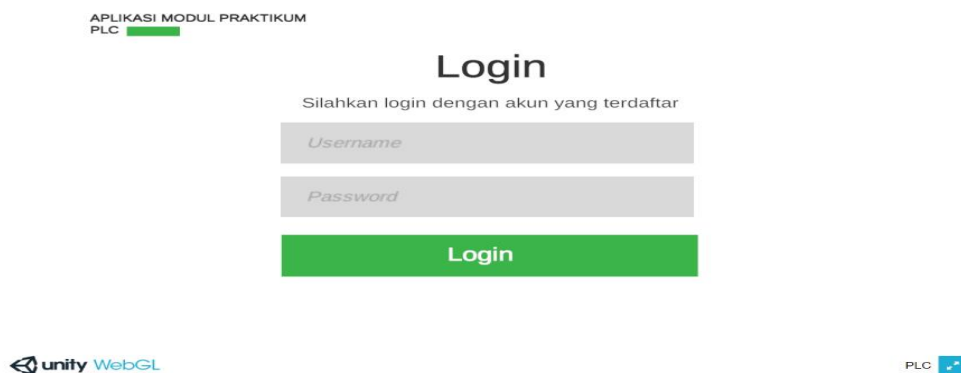


Figure 1. Login View

Figure 1 above shows the initial menu for using Web Virtual Reality Learning Media. In this menu there are start and exit options buttons. To start the process, the user can click the start button and then it will immediately display the Main Menu. After the login process, the Web Virtual Reality Learning Media will display the main menu. In the main menu there are four selection buttons, namely: (1) Lobby; and (2) Create Account.

Admin Menu

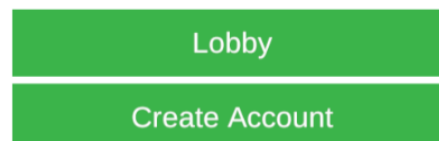


Figure 2. Main Menu

The first menu on this Web Virtual Reality Learning Media is Lobby. The function of this menu is to detect Web Virtual Reality objects of classroom and visualize them directly. The prototype display of the lobby can be seen as following Figure 3.



Figure 3. Web-VR Display on Start Menu

The next menu contained in the Web Virtual Reality Learning Media is the create account menu. This menu displays the create account menu along with an explanation of its function and component layout. On the account creation menu, users need to fill in their name, password, and the type of room to be used. The display prototype of the create account menu can be seen as following Figure 4.

Create Account

Silahkan buat akun baru dengan mengisi form berikut

Figure 4. Web-VR Display on Create Account

To be able to access learning, users can enter the class that has been accepted. In the classroom, there is an overview of the classroom atmosphere such as desks, benches, whiteboards, and industrial automation and data acquisition learning trainers. An overview of the classroom atmosphere can be seen in figure 5.



Figure 5. Web VR Display on Interface

After the user enters the classroom, the user can do industrial automation practicum learning and data acquisition. In this stage, users can simulate program execution and operate PLC components for learning. The appearance is seen in Figure 6.

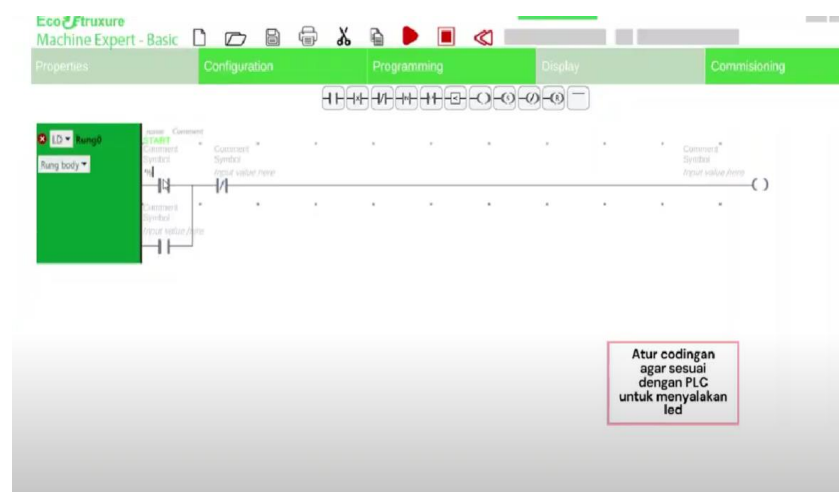


Figure 6. Web VR Display on Simulation Program

5. Web Virtual Reality Learning Media Validity Analysis

Learning Media Web Virtual Reality is declared valid if the results of the assessment of the two validators are at an average acquisition of > 2.50 to 4.00 . Testing of Web Virtual Reality learning media includes aspects of content, display, and programs. The results of the validity analysis test that have been assessed by the validator are presented as follows as:

Table 1. Content Validation Results

No.	Indicator	Validator 1	Validator 2	Average	Category
1	Material Quality	3.28	3.42	3.36	Very Valid
2	Language Quality	3.33	3.00	3.17	Valid
3	Material Update	3.00	3.00	3.00	Valid
	Overall Indicator			3.17	Valid

Table 2. Display Validation Results

No.	Indicator	Validator 1	Validator 2	Average	Category
1	Text Readability	3.50	3.50	3.50	Very Valid
2	Image Quality	3.00	3.00	3.00	Valid
3	Colour Compatibility	3.00	3.00	3.00	Valid
4	Button	3.50	4.00	3.75	Very Valid
5	Resolution	3.00	3.00	3.00	Valid
	Overall Indicator			3.25	Valid

Table 3. Programming Validation Results

No.	Indicator	Validator 1	Validator 2	Average	Category
1	Programming	3.25	3.50	3.38	Very Valid
2	Interaction	3.33	3.00	3.17	Valid
3	Efficiency	3.00	3.25	3.13	Valid
	Overall Indicator			3.22	Valid



The description of the general assessment results from the two validators on the aspects of the validity of the Web Virtual Reality Learning Media can be seen in Table 4.

Table 4. Description of Learning Media Validation Results

No.	Indicator	Average	Category
1	Content	3.17	Valid
2	Display	3.25	Valid
3	Programming	3.22	Valid
	Overall Indicator	3.21	Valid

Based on the results of the assessment of the two validators, the average assessment of the two validators is 3.21 so it can be concluded that the learning media developed in this study have met the valid criteria.

The average validity score of the Web VR learning media was found to be 3.21, categorizing it as "Valid". This score is derived from evaluations across three key aspects:

Content: Average score of 3.17, indicating validity.

Display: Average score of 3.25, also valid.

Programming: Average score of 3.22, confirming validity.

The content quality received an average score of 3.36, categorized as "Very Valid".

Language quality scored 3.17 (Valid), while material updates were rated at 3.00 (Valid).

Display aspects, such as text readability and button functionality, scored between 3.50 (Very Valid) and 3.00 (Valid).

Programming aspects, including interaction and efficiency, also scored valid ratings, with programming itself rated at 3.38 (Very Valid).

6. Web Virtual Reality Learning Media Practicality Analysis

Practical analysis was obtained from the responses of lecturers and students after the trial of the use of learning media. Practicality indicators consist of syntax components, social systems, reaction principles, and support systems in each small, limited, and field group trial. The results of the practicality test are as follows:



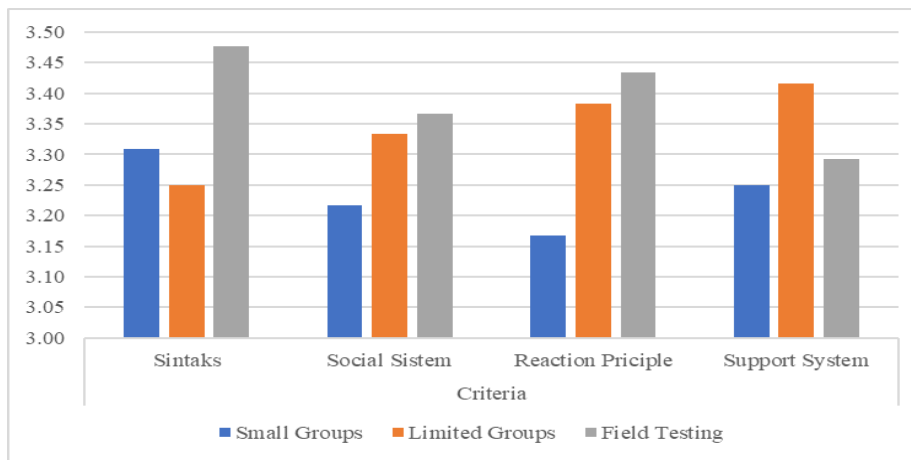


Figure 7. Students and Lecturers Response

Based on the results of practicality data analysis, the average practicality of Web Virtual Reality learning media is with very practical category. Therefore, the Web Virtual Reality learning media is stated to be very practical for use in learning the automation industry and acquisition data. With the development of technology and information, learning media plays an important role to help in the teaching and learning process, so that an educator can take advantage of learning media that is starting to develop to be used as a tool in delivering material so that the teaching and learning process is easier to do (Dian Hendrayana et al., 2022).

Nowadays, the use of technology in education has become commonplace. With the help of technology, learning activities can be improved and more varied (Mukhlisin et al., 2022). The use of the VR method in learning is considered more efficient, this is because VR can be done anywhere and anytime without being bound by space and time while on the network and VR can make the world look real (Auri Pramesti et al., 2022).

CONCLUSION

Digital technology that can be used by teachers in improving the quality of the learning process including Web Virtual Reality. Utilization of digital technology in the process learning can increase interest and motivation student learning, the quality of the learning process, and results learning.



Utilization of Web VR can be used in various activities, such as presentations, estimating an object, performance stimulant equipment, simulating a tool's performance, and others. There are several reasons for using Web Virtual Reality technology in education, namely: (1) to grab students' attention; (2) better understanding; (3) students can access the model from the device at any time; (4) students will retain more knowledge for a longer period of time; and (5) enjoy new ideas and think critically about the world around them (Munir, 2017).

Based on the results of the finding and discussion, the following conclusions are: 1) The Web Virtual Reality learning media consists of several main menu, including: start, create account, interface, and simulation; 2) The validity of the Web Virtual Reality Learning obtained a value of 3.21 with valid category; and 3) The practicality analysis result show that the Web Virtual Reality Learning Media is very practical category.

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