Development of Virtual Reality Application to Increase Student Learning Motivation with Interactive Learning in Vocational Education

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Abstract. In Vocational Education, learning by doing is very important to complement the concept of learning with technical introduction to maximize the results of the material received. However, in various subject areas, learning is still carried out conventionally and students are unable to apply their knowledge practically even though they have theoretical understanding. This is closely related to the lack of motivation from students in the classroom because there is no interactive course content required for visualization of concepts in each subject area. Even during the COVID-19 pandemic, teaching and learning activities had to be carried out online at their respective homes. So that further limits the scope of student practice to maximize learning outcomes. As a result, it is not possible for students to understand more in-depth concepts of subject matter using conventional learning methods. Students’ motivation to learn will increase if students are provided with practical tools so that they can be visually involved and engage with what they teach in class. The development of practical tools with Virtual Reality technology, which can visualize 3D models can be a solution to meet this goal. The main objective of this paper is to create and use Virtual Reality as an immersive learning medium and its contribution to student motivation to understand the definition of subject matter in various fields.

1. Introduction
A practical way of communicating ideas or concepts to others is through digital presentations that have utilized current information and communication technology, one of which is Virtual Reality technology [1]. Virtual reality is a system that allows users in a virtual universe that is replicated by a computer to communicate with an actual environment, so that users believe they are in that environment.

The Industrial Revolution 4.0 encourages the world of education to take part in the development of educational technology. In many laws and regulations of the Republic of Indonesia, the government has restricted the need for technology. One of them is specified in Permendiknas No. 41 of 2007 on Processing Requirements, in compliance with the Skill Standards for Graduates and Contents of the Learning Concepts used in item 13 of Permendiknas No. 16 of 2007 on the use of information and communication technologies to enhance the quality and effectiveness of learning.
With VR, students can do vocational training and enter the workplace environment according to their vocational, for example students from a culinary vocational can feel the atmosphere in a luxury restaurant kitchen, or students with medical majors who can experience situations facing critical patients, all of that becomes possible virtually. This technology can increase efficiency in the classroom and provide students with hands-on experiences [2].

VR for education will also allow students to face problems in their own way, building knowledge from their experiences. So, students can engage in authentic problems, explore solutions and can collaborate with others. Remarkably, this method was successful in increasing the learning ability of students who performed quite low [3]. The potential that VR has for increasing the potential for learning and student engagement cannot be underestimated. In a world increasingly based on experience, the value of VR continues to grow [4].

The reality of the implementation that occurs in classrooms today, teachers still use instructional techniques and books as learning materials, which are conventional learning methods and have not been carried out effectively and interactively. This will have an impact on the decline in student interest in learning because students feel bored.

To increase students’ interest in learning, the teacher’s efforts are needed to design and implement a learning model that is appropriate, interactive, and fun [5]. Digital training materials need to be used in the Industrial era 4.0 to meet national competitiveness targets that would replace traditional learning models. Therefore, it is necessary to have learning media that can make students feel the process of the Paiton PLTU power plant from the coal carried by the barge to the occurrence of electrical energy. Industry 4.0 encourages the education revolution with immersive technology, one of which is Virtual Reality (VR).

2. Model Preparation and Design
This research was carried out by mapping starting from the scope of recommendations for Virtual Reality materials that adapt to the subject curriculum and the specifics of basic competencies in Vocational High Schools (SMK). The design of the Industry 4.0 Virtual Reality model activity was carried out in several sessions according to the designed timeline, as follows:

- Analysis:
  a. Analyzing the needs of stakeholders
  b. Identification of IQ & KD in the curriculum
  c. School Identification
- Design
- Development
- Evaluation & Dissemination

2.1. Analysis
First, assess the need for the instruction to be the answer. Conduct instructional research to assess target perceptual, affective, and motor skills targets. Determine what skills learners are supposed to have, as well as the effect of acquiring these skills. Analyze the time available and how it can be done over a period of time. Some scholars also recommend an overview of the context and available tools.

2.2. Design
Translating learning goals into cumulative success outcomes and primary objectives for each material unit. Determine the learning subjects or units to be discussed and how much time will be spent on each of them. The sequence of units relevant to the goals of the program. Refining the unit of training, defining the key tasks to be accomplished for each unit. Establish the lessons and learning tasks of each class. Establish specifications for determining what students are studying.
2.3. Development
Allow recommendations on the forms of learning experiences and instructional resources. Prepare draft materials and events. Try materials and events for target group members. Examination, repair and manufacture of goods and events. Produce teaching teachers or extra content.

2.4. Evaluation & Dissemination
Market materials to be used by future teachers and learners. Provide assistance or help if needed. Implement student appraisal plans. Implement software review plans. Establish strategies for the maintenance of learning and review tasks.

3. Result and Discussion

3.1. Formatting the title
Development of the Power Plant learning media using Virtual Reality based on the Vocational High School curriculum. The curriculum in question is Core Competencies (KI) and Basic Competencies (KD).

Table 1. Core Competencies and Basic Competencies.

| CURRICULUM | Core Competencies (KI) | Basic Competencies (KD) |
|------------|------------------------|-------------------------|
|            | Describe the function of the components in a power plant | Demonstrating the function of components in a power plant |
|            | Explain the diagram of the working principle of a Power Plant. | Demonstrating a diagram of the working principle of a Power Plant. |

3.2. Asset Arrangement
Asset 3D models are made based on storyboards and discussions with teachers in schools as resource persons. Making 3D models of assets using Blender software and continued with Unity3D software to become a Power Plant VR application. The arrangement and placement of assets are adjusted to approach the existing Power Plant in the real world, namely the Power Plant Paiton East Java.

Figure 1. Paiton PLTU 3D Model
The next move is to assess the effectiveness of the product produced from the results of the development carried out, i.e. the "Power Plant" virtual reality educational media as in the following figure:

Checking the execution of the Power Plant application using the questionnaire process, which is a checklist table that is entered explicitly by the user after attempting to execute the Power Plant application. The questionnaire you use applies to the USE Questionnaire. The questionnaire is prepared and given to 20 students in its sub-use, accessibility, quality of use, ease of learning and contentment. Several questions will be posed with the following answers: "Strongly agree," "Agree," "Disagree," "Strongly disagree." Any problems are designed such that whether a person is pleased with the process of education he or she expresses his or her approval. The example of a query is given in Table here.
Table 2. Questionnaire.

| NO. | QUESTION                                                                 | RESPONSE                        |
|-----|---------------------------------------------------------------------------|---------------------------------|
| 1   | I love studying electric power generation                                | 3 strongly agree, 16 agree, 2 disagree |
| 2   | I am more excited about studying power plant with this app               | 2 strongly agree, 16 agree, 3 disagree |
| 3   | This application makes it easier for me to observe the power generation process | 3 strongly agree, 15 agree, 3 disagree |
| 4   | How to use this application is very easy                                | 5 strongly agree, 15 agree, 1 disagree |
| 5   | I like the look of this app                                              | 2 strongly agree, 15 agree, 4 disagree |

The following table shows the results of the limited implementation of these 21 students at SMK Nurul Jadi Probolinggo. The implementation in the chart below starts from questions 1-5.

The limited questionnaire results show that the students agree with the use of the Power Plant VR application. It is hoped that it can be implemented in a wider environment in the future so that more data can be obtained for further better application development.

It is hoped that this technology will provide an easy way to achieve progress in the teaching and learning process of SMK Nurul Jadi Probolinggo students. So that it becomes an attraction as a learning medium in the form of animated 3D display media.

4. Conclusion

Learning media that are boring and tend to be unattractive can make most people feel lazy and reluctant to know and explore a discipline such as what is needed by most students in Indonesia and even in Southeast Asia. Based on this, a learning media with virtual reality technology called Power Plant was created as a learning medium in one of the majors in the Vocational High School (SMK) in the power generation engineering department (TPTL). The design of this prototype is based on the Core Competencies (KI) and Basic Competencies (KD) of Vocational High Schools. However, there are many aspects that need to be addressed when using this technology, such as the creation of more attractive 3D models and simulations, gaming to draw student learning interest, and so on. This research also needs to be developed with respect to the model used not only for the learning of electrical energy, but it is hoped that it will also be developed for other topics.
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