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Study on the Use of Virtual Reality-Based Instructional Media as a Practice Support Theory

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ABSTRACT

This study aims to determine whether Virtual Reality-based instructional media can be used in theoretical lessons as practical support. How effective Virtual Reality-based instructional media can support practical learning, make learning more interesting for students, and better impact learning outcomes. The research was conducted at the Department of Mechanical Engineering FT-UNP in the January-June Semester of 2022 with 60 students as research subjects. The research began by developing Virtual Reality media tailored to the material introduced to the lathe. Furthermore, students try Virtual Reality equipment to understand the material about lathe machine introduction after learning the theory of the introduction of lathe machines virtually, followed by using a lathe machine directly. as comparison data. Data on learner comfort is collected using questionnaires and interviews. The questionnaire uses an interval scale of very good >80%, good (60%-80%), sufficient (40%-60%), less (20%-40%), and significantly less <20%. Analysis of the response to the use of Virtual Reality equipment developed resulted in a response of 72.26%, while learner satisfaction in using Virtual Reality resulted in an average response of 68.45%. Observation measurement of the practical implementation of lathe machines directly shows an average of 72.89% satisfaction. After combining the results of interviews and observations, it can be concluded that this Virtual Reality application can help students understand the theory of practical support.

Keywords: *Virtual Reality, Practice Support Theory, Instructional Media.*

1. INTRODUCTION

Learning outcomes in the psychomotor aspect can be achieved if students perform direct joint movements on the object of the learning tool [1]–[4]. However, before students practice on the machine that is the object of learning, students must first have cognitive and affective abilities about the object or tool to be used [5]–[7]. Without prior knowledge of the use of tools, learners will be confused, which can lead to negative things such as taking a long time to master psychomotor achievements, which can cause accidents that can damage tools and physical learners [8]. So it can be said that an introduction to the tool, including how to work and operate it, is essential.

In conventional learning, learning theory supporting practice is done separately with practice time [9], [10]. Learning materials are delivered face-to-face in the classroom with the learning strategy of educators explaining and students paying attention. There is also learning that uses video media to convey material about the knowledge of these tools [11], [12]. The development of instructional media technology is increasingly advanced so that learning outcomes can be achieved better, including Virtual Reality which is a technology that allows users or users to interact with the environment that exists in cyberspace simulated by computers so that users feel they are in that environment [13]–[17]. In classrooms, using VR allows students to retain knowledge better and helps students with learning difficulties. Virtual reality, combined with pedagogical concepts, will make technology a medium and a stimulant. Learners become happier in learning and have high curiosity [18], [19]. Anna Patete [20] explained that through Virtual Reality, students can experience the digital world according to the learning material provided

by the educator. Things that may be difficult to do in the real world. Virtual reality can be accessed and enjoyed using smartphone devices and Google Cardboard or Oculus Rift and applied in all subjects [21], [22].

Virtual reality requires the following supporting equipment: a VR headset, glove, and walker [23]. The glove helps move the hand and send information about our movements in the real world to the virtual reality world. The headset helps monitor the user's head and see the virtual reality world. At the same time, walkers help monitor foot movements from the real world to the Virtual Reality world. In the VR headset, there are six parts, namely: (1) Display, cover, (3) sponge, (4) lens, (5) dial, and (6) circuit board. The display of Oculus Rift is already an HD display that is useful for displaying 3D depictions with a 360-degree angle. The image is projected through a particular lens with VREAM software then our brain automatically gets used to the image until we feel that we are in the real world [24]. So, on a Virtual Reality headset, it will be more evident that it differs from reality. However, overuse may cause users to feel nauseous and dizzy.

Virtual Reality works by starting with the user seeing a pseudo world that is actually dynamic images resulting from computer simulations. Then, through a tool shaped like Virtual Reality glasses, a user can interact with the pseudo world and get real physical and fiction feedback [25]. Virtual reality's benefits in education are that it can be used as inquiry-based learning. Inquiry-based learning emphasizes the critical and analytical thinking process to seek solutions to problems [26].

Figure 1. Virtual Reality Box

Virtual learning is learning that can be packaged close to real situations with the help of interactive instructional media Virtual Reality [27]. Virtual reality media is applied to the Machining Technology course [28]. This study aims to determine whether virtual reality media can help to learn in courses whose learning outcomes are skills.

With this technology, the information students receive will be better if educators use Virtual Reality media when implementing the learning process [29]. As an educator, you are expected to be able to motivate students to learn well [30]. Professional teachers must understand how to convey knowledge to students well [31]. According to available resources, educators can choose a more effective assessment method [32]. Machining technology is a field of study that can be used to compare similarities between global education and global work [33].

This course is an exclusive practical field of study that the student faces using real work. [34]. In this course, there are obstacles, namely explaining online practical learning to students in the Department of Mechanical Engineering, Faculty of Engineering, Universitas Negeri Padang due to the Covid-19 pandemic, so learning is not efficient, and problems still occur. Iinstructional media is all material related to software and hardware that can be made to provide the content of teaching materials originating from learning sources to learners who can stimulate learners' thoughts, emotions, and desires so that the learning mechanism is more robust [35]. The world of education must be able to keep up with the current state of science and technology development.

2. METHOD

This research method uses the Plomp development model, which has three stages, namely, the initial investigation phase (preliminary research phase), the prototype phase (prototype phase), the implementation phase of learning using Virtual Reality, and the last one is evaluation (assessment phase) [36].

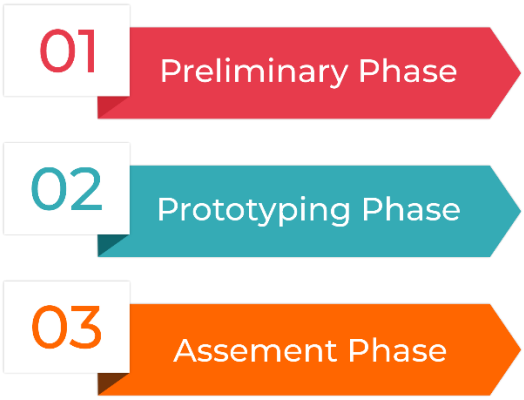

Figure 2. Plomp Development Model

Phase 1, researchers investigated the problems that occurred during the Covid pandemic related to learning Machining Technology. At this stage, it was found that the problem of learning Machining Technology practicum could not be carried out by bringing students to the practicum room to operate existing machines. Of course, this impacts learning outcomes in the psychomotor aspect that cannot be achieved due to the inability to do direct learning on the grounds of covid 19.

Phase 2 is developing VR applications with Machining Technology material. After the application has been developed, peer opinions are asked whether the

application is suitable for Machining Technology material and whether the VR technology developed is following the learning needs of machining technology.

Phase 3 will learn Machining Technology using VR applications developed for 60 students. And stage four is to evaluate the implementation of VR applications in terms of practicality and convenience of students using the developed VR applications. A questionnaire is used to measure the practicality and comfort of using VR applications.

3. RESULT AND DISCUSSION

3.1. Preliminary Research Phase

The most critical element in designing instructional media is to define the problem. Suppose the problem is a case of a gap between what is happening and the desired situation. In that case, it is necessary to investigate the causes of the gap and describe them carefully. Investigation of the most essential elements is to collect and analyze information, define the problem, and plan the continuation of the project activities in the form of observation, collection of analysis, and defining the problems that occur in the lathe learning process on campus. Curriculum Analysis on the Semester Learning Plan used in this Virtual Reality media is in Week 5, Study Material 1, namely Knowing How Lathe Machines Work, but the author only takes the Introduction of Lathe Machine Components and Their Functions.

Analysis of the problems in learning, especially in students who tend to be more bored in the learning process that is lecture and listening from the lecturer's presentation in one direction. Some students do not understand what the lecturer explains because they do not recognize the direct form of the lathe-based on the results of interviews with lecturers of Machining Technology courses at the Department of Mechanical Engineering, Padang State University obtained some information on the learning process using conventional instructional media in the form of PowerPoint or Youtube videos that have not used interactive technology-based instructional media.

3.2. Development or Prototyping Phase

At the development stage, Virtual Reality-based instructional media prototypes are designed using Blender software, Microsoft Visual Studi 2019, Android Studio, Vuforia Engine, and Unity 3D. Virtual Reality-based interactive instructional media is made by developing visual elements in text, images, moving animations, and audio. Interactive media also has navigation buttons in each display to make it easier for students and teachers to operate. The display of interactive learning media developed is as follows.

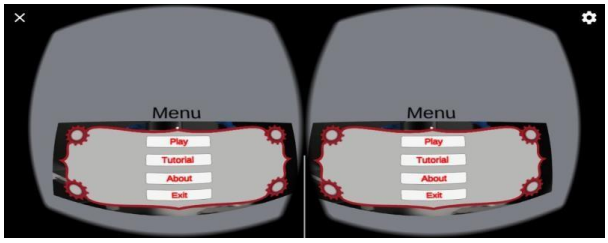

Figure 3. Virtual Reality Main Menu

The main menu display of the Virtual Reality application has four main menus, namely: Play, Tutorial, About, and Exit, which have each function according to the settings that have been designed in Unity 3D.

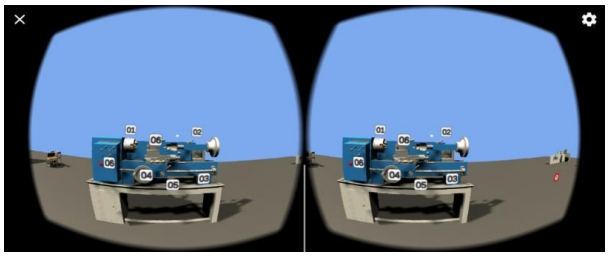

Figure 4. Theory Supporting 3D Lathe Practice

3D object display of Virtual Reality lathe machines that provide real-time learning experiences visible in 360 ° light blue background and visible lathe images. On the lathe, six buttons explain the components of the lathe components; this button has a white color and black writing.

Figure 5. About Menu Display

The background display on the profile menu is dominated by red, and the background of the writing is white. The profile page contains the author's identity, as shown in Figure 5.

After making revisions to prototype 1, prototype two was obtained. Prototype 2 was evaluated based on the results of guidance from the supervisor, where the development results are the addition of brief audio explanations of the lathe machine.

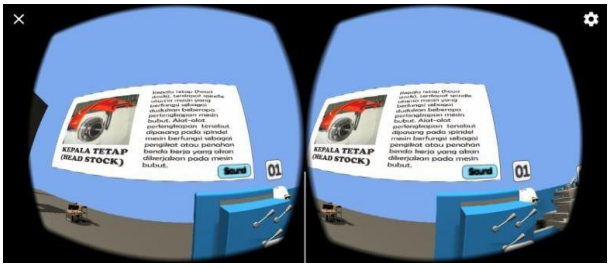

Figure 6. Virtual Reality Fixed Head

Figure 7. Virtual Reality Detachable Head

Figure 8. Virtual Reality Fixed Head

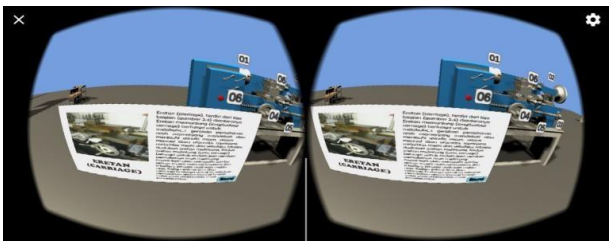

Figure 9. 3D Lathe Machine Crankshaft

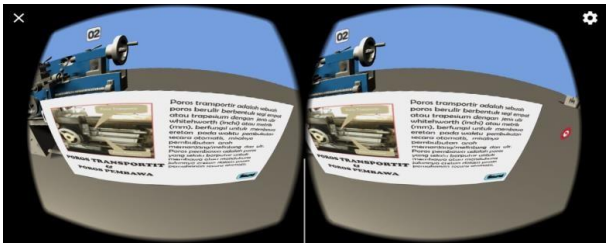

Figure 10. 3D Transport Shaft

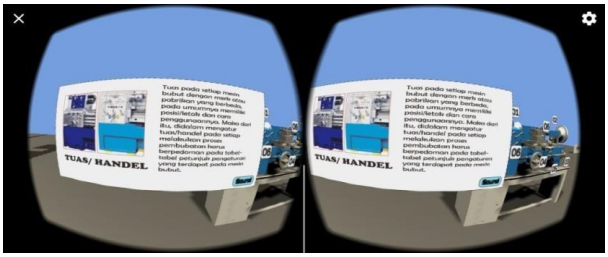

Figure 11. 3D Handle Lever

After making revisions to prototype 2, prototype three was obtained. Prototype 3 was evaluated by conducting expert validation (Expert Review), namely the media discussed with experts to obtain valid media. The validity test was carried out by two lecturers from the Department of Mechanical Engineering FT UNP and one from the Machining Technology Course lecturer.

3.3. Assessment Phase

After the review, practicality, and efficiency tests were conducted. Practicality means the degree of media use by expert lecturers. Virtual Reality-based interactive instructional media was tested for practicality in a small group trial by distributing questionnaires for the practicality test of lecturer responses given to 3 lecturers teaching Machining Technology courses. In contrast, the student response practicality test was given to 60 students of the Mechanical Engineering Education Study Program and Diploma III Faculty of Mechanical Engineering, Padang State University.

All data obtained on each indicator about the Design of Virtual Reality Interactive Instructional Media in Machining Technology Courses at the UNP Mechanical Engineering Department will reveal the mean, median, mode, standard deviation, minimum, maximum, and total scores.

Table 1. Results of Validation of Media Experts, Material Experts, and Teaching Lecturers About the Use of Virtual Reality

Validasi	Score	Mean	Percentage (%)	Criteria
Media Expert	81	4.76	95.29	Very Valid
Material Expert	71	4.17	83,5	Valid
Practicality	68	4	80	Practical

Based on the table above, it can be seen that the Design of Virtual Reality Interactive Instructional Media in Machining Technology Courses in Mechanical Engineering UNP obtained information that the level of achievement of respondents was 95.29, 83.5, 80 from Media Experts, Material Experts, and one of the Lecturers of Machining Technology Courses. After obtaining the results of the respondent's achievement level, it is known that the perception of learning practitioners towards the design of interactive learning media Virtual Reality in Machining Technology courses is "Practical."

4. CONCLUSION

Virtual Reality-based instructional media based on research obtained an average media aspect validation result of 95.29, which can be concluded that the Virtual Reality application is very valid for use. The results of

the use of material aspect validation result 83.5, which concluded that the Virtual Reality application was valid. The use of Virtual Reality applications is based on the assessment of one lecturer of the Machining Technology course as a learning practicality.

Based on the assessment of learning practitioners is very practical. This can be seen based on the assessment given by one of the Machining Technology Lecturers at the Department of Mechanical Engineering, Faculty of Engineering, Universitas Negeri Padang 80, who stated that the Virtual Reality application was practical. Based on the acquisition of the value of the respondent is very effective.

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