Implementation of Virtual Reality (Vr) in Applications Android-based Work Safety Tools for Vocational Student Learning

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Abstract: *Occupational health and safety (K3) is one of the lessons that explains the efforts for workers to maintain safety and health while in. One of the most commonly studied in K3 at SMK is the use of personal protective equipment that serves to protect themselves from work accidents. Virtual Reality (VR) is one of the innovations in technology that allows humans to interact with the environment not directly. VR technology can be used in the world of learning that is more interactive and allows the development of new methods of learning. The learning application made in this study contains basic K3 material and personal protective equipment that uses Virtual Reality features. The application was tested on class X students of mechanical engineering. The evaluation method uses pre-test-post test and questionnaire survey. The results of the pre-test - post-test obtained an average increase from 72.58 to 91.6 or by 26.2%. In the questionnaire survey, 98% of responses agreed in the material and application features.*

1. Introduction

Education is the most important activity in human life. Through education, various aspects of human life are developed through the teaching and learning process. To fulfill the needs of learning needs in schools, schools should utilize the technology of teaching media that capable of stimulating learning so that the learning process becomes more effective. In the modern era where a lot of information and knowledge is available, adopting and applying the right technology for more efficient learning solutions. technology for a more efficient learning solution. Virtual reality (VR) provides a experience in various fields including education[1]. Virtual reality (VR) technology is now technology can now be used as a learning activity, due to its fun learning experience. This learning makes students actively interact with the taught content, where students develop their own framework of thinking along with how to learn. This learning makes students actively interact with the taught content, where students develop their own framework of thinking along with how to solve their own problems [2]. One of the places of teaching and learning is Vocational High School (SMK). Competency standards that used as a reference for curriculum development for the Machining Engineering Expertise Package is the Indonesian National Competency Standard (SKKNI). Indonesian National Work Competencies (SKKNI) in the Metal and Machinery Industry. One of the competency standards competency standard is to apply occupational safety and health (K3) [3]. Implementation of the use of PPE in K3 is one form of effort to create a workplace that is safe, healthy, free from environmental pollution, so as to reduce the use of PPE. from environmental pollution, so as to reduce the occurrence of work accidents and occupational diseases and ultimately can increase efficiency and health. and ultimately can increase work efficiency and productivity [4]. The value of adopting virtual reality (VR) in education and learning is partly related to the fact that this technology can enhance and facilitate learning and technology can enhance and facilitate learning and make better and more entertaining decisions[5]. Therefore, the purpose of this final project is to provide VR applications to

facilitate learning and simulation in explaining protective equipment. learning and simulation in explaining personal protective equipment along with its explanation and function for vocational students. for vocational students. With the help of VR, work safety tools can be visualized so as to simplify learning and make learning more interesting. facilitate learning and make learning more interesting.

2. Methodology

The research steps are creating a testing model, making VR applications, implementing the testing model, and analyzing the test results In this final project, the testing model carried out is to create a pre- test and post test system and test the VR application. *Pre-test* is a test to determine students' knowledge of material about PPE and a brief explanation of K3. *Pre-test is* given before learning practice. In learning practice, students use this *VR* application in learning practice. Learning uses the material and simulation menu in the application for learning material about PPE and a brief explanation of K3. *Post-test* is a test to determine student knowledge after learning is done using the application. The post-test used is the quiz menu in the learning application. Making applications using *Unity.* Making applications is made based on the *flowchart* design that has been made first. The application material is based on the book used by the school. The material used is the understanding of basic K3 and various kinds of *safety tools*. System testing is applied based on the previous chapter on system design. The initial stage carried out is to carry out a *pretest*. At this stage, students are given a *pretest* quiz sheet that must be done. The next stage is testing the application on students. At this stage students try all the features of the application. The last stage is the *post-test*. At the last stage, students answer the application quiz and fill out the application assessment questionnaire sheet given. Analysis obtained in the form of test results and questionnaires.
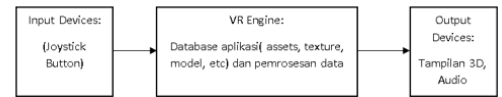
2.1 Images

Figure 1 Testing model to be used
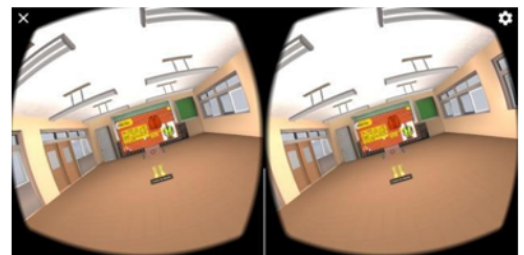

Figure 2 VR simulation creation using unity

Figure 3 VR mode test

Figure 4 Testing done by the user

2.2 Tables

Table 1 Results of tests conducted

No.	Name	Pre-test	Post-Test
1	Adrianto	80	100
2	Alvian	60	80
3	Baron	90	100
4	Diva	80	100
5	Endrik	60	80
6	Fauzan	90	100
7	Ibnu	90	100
8	Imron	90	90
9	Iqbal	70	90
10	Khusnul	90	100
11	Mahmud	60	90
12	Octa	80	100
13	Pangestu	70	100
14	Pradana	80	100
15	Pradita	60	80
16	Rani Angri	50	70
17	Rayhan	50	80
18	Richo	70	90
19	Riko	80	100
20	Rio	80	100
21	Rivals	60	80
22	Satria	70	100

23	Septian	60	80
24	Shaqina	60	90
25	Sacred	70	90
26	Sunarji	90	100
27	Surya	90	100
28	Tegar	80	90
29	Wijaya	80	100
30	Yuliantina	70	90
31	Zulham	40	70

Table 2 Application satisfaction survey results

No.	Question	Answer	
		Agree	No Agree
1	The text on the app easy to read	30	1
2	All features in the App can be goes well.	30	1
3	The "help" menu helps me in using the app	31	0
4	The application can make it easier for me in learning about safety tools	31	0
5	The content of the material on "Material" is easy understood	31	0
6	The content of the material on "Simulation" is easy understood	30	1
7	The content in "Quiz" corresponds to the "material" and "simulation"	30	1
8	The content of the app is interesting	29	2
	Total	242	6
	Average (%)	98%	2%

3. Experiment Result

The *post-test* scores of all students who have taken the test increase from the *pre-test* scores that havebeen done first. The average of can be obtained by the following formula:

$$Average = \frac{Total\ score}{Number\ of\ students}$$

From this formula, the average value of the *pretest* is 72.58 and the average of the *post-test* is 91.6. For the increase in test scores, the average percentage of scores can be obtained using the following formula:

$$Increase = \frac{(Posttest\ average) - (Pretest\ average)}{Average\ pretest} \times 100\%$$

From the percentage increase formula used, an average increase of 26.2% was obtained. From the tests given, the *pre-test* and *post-test* methods can determine students' understanding of the material presented. From the overall data obtained from testing the application on students, two responses were obtained, namely the agreed response and the disagreed response. The agreed response received 242 answers or as much as 98% of the total questionnaire answers. While the disagree answer only got 6 answers or as much as 2% of the total questionnaire answers. From the questionnaire it was found that 98% were satisfied with the application and features in VR safety tools.

From the research, the response of vocational students to research using VR learning applications was obtained. The percentage increase used obtained an average increase of 26.2%. From the test given, the *pre-test* and *post-test* methods can determine students' understanding of the material presented. As for thequestionnaire, most high school students agree with the tests and applications used. Suggestions obtained from this research are that testing should be done more than once to measure the validity of the data and the making of questions given must be different between the pre-test and post-test.

4. Conclusion

The VR Safety Tools application has been successfully made and in accordance with the learning needsat school. From the satisfaction results obtained from the user survey, 98% of positive responses to application features and materials were obtained. Evaluation of the application of learning using VR Safety Tools using evaluation pre-test and post-test. The average increase obtained from the test was 26.2% and all students' scoresincreased.

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