

BLOG POST

Project-based Virtual Reality Learning in Mechanical Engineering Labs: Improving 21st Century Skills
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Background

Challenges

- The world of industry moved to automation with the transformation of existing technology (21st Century Skills: learning skills, literacy skills, and the skills)
- Work-related learning environment
- Work-related learning model
- Vocational education is education for work, education through work, and education at work

Vocational Education

Vocational education and training will be effective and efficient if the methods, operations, tools, machines and environment are replicas of the industry

Model and learning environment

Project-based learning
Virtual reality

Hypothesis (H)

H1: PJBVR can increase digital literacy
H2: PJBVR can support active and fun learning
H3: PJBVR can improve Learning Outcome (L.O)

Materials and methods

Materials:
Questionnaire with 28 statements for 171 respondents to answer 3 questions

Methods:

- Survey with purposive sampling (Mechanical Engineering Vocational Education Students in Higher Education)
- Analysis using quantitative research through Likert - 5 scale
- Descriptive statistic using pie chart, bar chart, mean score, mode and median

Respondents Demography

Number of Respondents by Year of Class

Respondent's Gender

Findings

Hypothesis	Group	Percentage
H1: more than 50% of respondents stated that PJBVR can increase digital literacy	G1	64.5%
	G2	59.1%
	G3	64.1%
H2: more than 50% of respondents stated that PJBVR will support active and fun learning	G1	64.5%
	G2	59.1%
	G3	64.1%
H3: more than 50% of respondents stated that PJBVR will improve learning outcomes	G1	64.5%
	G2	59.1%
	G3	64.1%

Conclusions

- H1: more than 50% of respondents stated that PJBVR can increase digital literacy
- H2: more than 50% of respondents stated that PJBVR will support active and fun learning
- H3: more than 50% of respondents stated that PJBVR will improve learning outcomes

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The scientific objective of this research is to provide a learning experience using Virtual Reality Lab media to increase learning motivation, technology skills and digital literacy for Mechanical Engineering Vocational Education students. The research context is the development of learning media to train 21st century skills needed by the world of education and industry.

Currently, many manufacturing industries have trained their employees to use Virtual Reality technology to reduce the risk of equipment damage and employee safety (Wall Street Journal, 2020; CNBC, 2019). These industries such as Google, Microsoft, and NASA, besides that many have also started to be developed in Indonesia such as Loreal Company, Toyota Motor Manufacturing Indonesia, and Telkom CorpU (CNBC, 2019; NASA, 2016; Adilah, 2020; Widya, 2016).

Based on Adilah (2020) at smarteYE.id stated that Loreal provides this experience to new employees and visitors to the Loreal factory. Toyota Motor Manufacturing Indonesia made a VR module related to the identification of hazards in the work area, then Telkom CorpU made VR Training for technicians in wearing Personal Protective Equipment (PPE) and ODP installation. Then Walmart provided more than 1 million Oculus VR headsets to train employees with more than 45 modules and delivered a 10-15% increase in training retention. So, it is important that Mechanical Engineering Education students begin to be introduced to VR technology in the Lab. This is expected to have a positive impact on graduates when they enter the world of work to be better prepared to face technological transformation in the future.

The research methodology used is research and development of the ADDIE model (Analysis, Design, Develop, Implement and Evaluate) with the steps of Analysis, Drawing, Development, Implementation, Pilot Execution, Evaluate (Branson et al., 1975; Constancio et al., 2019; Chiou et al., 2020).

The expected scientific benefits of learning efficiency using immersive virtual reality technology are the effective use of learning time, the use of flexible learning places, cutting operational costs and raw materials in practice, and safety in the practical learning work process. From the results of the need assessment preliminary study, it was found that around 64.5% of respondents stated that project-based virtual reality learning could improve digital literacy, 59.1% of respondents stated that project-based virtual reality learning could support active and fun learning, and 64.1% of respondents stated that project-based virtual reality learning can improve distance learning outcomes. Based on the analysis of these needs, it is important for the world of vocational education to take advantage of emerging technologies in distance or online learning to train basic vocational skills, digital skills, provide work character, provide national character values through learning experiences using cyber-physical systems with virtual reality technology.

Keywords: Project-Based Learning, 21st century learning, virtual reality, immersive, learning experience

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