

Implementation of Virtual Reality as an Interactive Steam Learning Media for Prospective Teachers at UNESA, UNP, and UNY

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ABSTRACT

This research is motivated by the demand for integrating technology in Science, Technology, Engineering, Art, and Mathematics (**STEAM**) education, aligning with the criteria of the 21st century. Additionally, it corresponds to the recommendation from the Ministry of Education and Culture on the optimization of Technological Pedagogical Content Knowledge (**TPACK**) in STEAM education. To realize STEAM learning by optimizing TPACK, especially for prospective teachers in higher education, an engaging medium or technology is needed. One such option explored in this research is Virtual Reality (**VR**). VR is a technology that enables users to interact with a simulated computer-generated environment in the virtual world, providing a sense of presence within that environment. VR is also known as virtual reality. The use of VR has the potential to enhance critical thinking skills, social abilities, and emotional capabilities for prospective teachers, warranting further investigation. **The general objective** of this research is **to implement and analyze Virtual Reality** as an interactive STEAM learning medium for prospective teachers at Surabaya State University (UNESA), Padang State University (UNP), and Yogyakarta State University (UNY). Specifically, **the research questions** are formulated as follows:

1. How does **the mastery of STEAM concepts** improve among prospective teacher students at UNESA, UNP, and UNY through the application of VR?
2. How do **the critical thinking skills** of prospective teacher students at UNESA, UNP, and UNY improve with the application of VR?
3. How do **the social skills** of prospective teacher students at UNESA, UNP, and UNY improve with the application of VR?
4. How do **the emotional skills** of prospective teacher students at UNESA, UNP, and UNY improve with the application of VR?

The four main variables investigated support efforts to enhance the pedagogical, professional, social, and personal skills of prospective teachers. **The adopted research method** is a mixed-method approach with an explanatory sequential research design. **The quantitative** part applies a true experimental research design on the VR treatment prepared, while **the qualitative** part uses in-depth interviews to gain a profound understanding of the studied knowledge and skills. The research subjects are physics and ICT prospective teacher students at UNESA, UNP, and UNY. The focus of this research is the implementation of the latest interactive STEAM learning media (**lato-lato in the context of momentum and collisions, ethno-STEAM cow racing, and kinematics and dynamics of rolling barrels**) at UNESA as the host institution, and UNP and UNY as partner institutions. Furthermore, **the technology readiness level** (TKT) for this research is at level 3, involving the demonstration of a model or prototype system/subsystem in a relevant environment. **The expected outcomes** include three articles (one host article and two partner articles) indexed in reputable databases with a minimum Q2 ranking and an interactive virtual reality STEAM learning medium that has obtained intellectual property rights.

Our team has produced three virtual reality-based products: lato-lato, cow racing, and rolling barrel simulations. Additionally, three intellectual property rights have been secured for these products, and one is currently in the application process. Besides the mentioned achievements, the team has submitted articles to reputable journals, currently undergoing the review process.

Kata Kunci: *virtual reality, STEAM, lato-lato, cow race, rolling barrels*