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Development of Live-Worksheets Technology based on the Problem Based Learning Model in the Horeg Sound Wave Phenomenon

Rahmatta Thoriq Lintangesukmanjaya[1], Oktamia Ramadhani[1], Dwikoranto[1], Noval Maleakhi Hulu[2]

[1]Physics Education, Universitas Negeri Surabaya, Surabaya, Indonesia
[2]Mechanical Engineering, Monash University, Malaysia

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ABSTRACT

Objective: *Developing interactive Live-Worksheets based on Problem-Based Learning (PBL) on physics material with a contextual phenomena approach.* ***Method:*** *This research is a Research and Development (RnD) study. This type of research uses the 4D method, which includes four stages: define, design, develop, and disseminate.* ***Results:*** *The results of developing live-worksheet technology based on the Problem-Based Learning model with the sound horeg phenomenon have proven to be valid and practical. The implementation of digital technology-based live worksheets using a problem-based learning model has been proven to increase student learning independence and enthusiasm through real-world phenomena such as sound waves. Looking ahead, the integration of intelligent technologies such as AI, VR, and virtual simulations has the potential to strengthen interactive, contextual, and practice-oriented physics learning.* ***Novelty:*** *The integration of technology and problem-based learning models can encourage students to generate new ideas from the problems presented. The use of AI technology in integrated learning media is crucial, and innovation in ethnoscience approaches is needed.*

INTRODUCTION

In an era of rapidly advancing technology, education must adapt to digital developments while simultaneously instilling 21st-century skills, particularly problem-solving (Avdiu et al., 2025). The integration of technology into the learning process serves not only as a tool but also as a means to build more interactive, contextual, and meaningful learning experiences (Saputra et al., 2025). In this context, the application of technologies such as Live-Worksheets is expected to provide students with space to actively participate, explore phenomena, and develop critical and analytical thinking skills through a problem-based learning approach (Sari & Jusra, 2023).

Learning physics as a branch of science plays a crucial role in fostering strong conceptual understanding (Munfaridah et al., 2021). By applying innovative, student-centered learning technologies, it is hoped that students will not only understand physics concepts theoretically but also relate them to real-world phenomena, such as sound waves in the context of Sound Horeg (Lintangesukmanjaya et al., 2025). Therefore, the development of Live-Worksheets technology grounded in the Problem-Based Learning model is a strategic step toward strengthening students' scientific literacy, creativity, and problem-solving skills in the digital era.