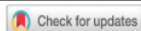




Improving Problem-Solving Skills With Problem-Based Learning Models in Optical Wave Courses

Mirza Roma Apsari^{1*}, Zainul Arifin Imam Supardi², Rinie Pratiwi Puspitawati³,
Mohamm¹² Budiyanto⁴

^{1,2,3,4} Universitas Negeri Surabaya, Surabaya, Indonesia



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ABSTRACT

Objective: Problem solving skills are one of the skills one has to live in the 21st century. Therefore, research aims to explain the improvement in problem-solving skills using a problem-based learning model in optical wave courses. This research was carried out on 3rd-semester students majoring in undergraduate program Science Education at the State University of Surabaya in two classes. **Method:** The research design used the one-group pretest-posttest design with one repetition—data collection techniques using observation and test techniques. Observations were made to review practical aspects and tests for reviewing the effectiveness aspects. **Results:** The observation results indicate that the learning process is classified as practical. The average result of problem-solving skills in class U students is better than in class B. Based on their problem-solving skills, students can solve problems to completion. The knowledge test results are in the moderate range. A paired T-test in each class shows a significant difference between the results before and after learning. The achievement of knowledge and skills shows that the problem-based learning model effectively improves their problem-solving skills in the waves and optics courses. **Novelty:** The novelty of this research is the use of four indicators adapted to optical wave material under learning conditions after the COVID-19 pandemic.

INTRODUCTION

Problem-solving skills need to be possessed by elementary, middle, and high school students to support their thinking patterns. According to Lopez-Jimenez et al. (2021), steps to guide, monitor, and assist students in solving problems can develop their critical thinking skills. Since being the elementary and secondary school levels, the government has designed lessons to train critical thinking and problem-solving skills. Difficulties in everyday life are unpredictable; therefore, practical and valuable skills are needed in the current era (Muhlisin et al., 2022). The ability to solve problems plays an essential role in the survival of society (Nurjannah et al., 2021). According to Haryani et al. (2021), as has been done by many other countries, in 2017, the Ministry of Education and Culture of the Republic of Indonesia began to promote curriculum integration in learning skills and innovation in the 21st century, known as the 4Cs: creativity and innovation, critical thinking and problem-solving, collaboration, and communication. Critical thinking has become one of the main goals of education in the 21st century because global market trends also require graduates to apply their critical thinking skills to the work environment (Wijayati et al., 2022). Critical thinking skills can be developed by integrating problem-based learning models into learning (Masruro et al., 2021). One of the thinking skills that can be developed is problem-solving skills needed in the 21st century (Batlolona et al., 2018).

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