



## Integration of PJBL, STEAM, and Learning Tool Development in Improving Students' Critical Thinking Skills

Sri Dwi Indahwati<sup>1\*</sup>, Fida Rachmadiarti<sup>2</sup>, Eko Hariyono<sup>3</sup>  
<sup>1,2,3</sup> State University of Surabaya, Surabaya, Indonesia



DOI: <https://doi.org/10.46245/ijorer.v4i6.434>

### Sections Info

#### Article history:

Submitted: September 15, 2023

Final Revised: October 23, 2023

Accepted: October 24, 2023

Published: November 07, 2023

#### Keywords:

Critical thinking;

Project Based Learning (PjBL)

Renewable Energy;

STEAM (Science, Technology,  
Engineering, Arts, and  
Mathematics).



### ABSTRACT

**Objective:** This research aims to explore improving critical thinking skills by applying Project Based Learning (PjBL) based on the STEAM (Science, Technology, Engineering, Arts, and Mathematics) model in Renewable Energy material at 1<sup>st</sup> Trowulan State Vocational School. The main aim of this research is to assess the effectiveness of STEAM-based PjBL in improving students' critical thinking skills at 1<sup>st</sup> Trowulan State Vocational School Trowulan. **Method:** The research method used was an experiment with a One Group Pre-test and Post-test design. The research subjects comprised 25 students of Class X Computer and Network Engineering 1 (X-1) and 26 students of Class X Computer and Network Engineering 1 (X-2). During the research, students were given PjBL-based learning with a STEAM approach to Renewable Energy material. Before and after learning, students are tested using a pre-test and post-test to measure the increase in their critical thinking skills. **Results:** The analysis shows that implementing PjBL-based learning based on STEAM is efficacious in improving students' critical thinking abilities. A comparison of pre-test and post-test scores on Renewable Energy material shows a significant increase in students' critical thinking abilities. **Novelty:** The novelty of this research lies in its new contribution to the field of education. The combination of the PjBL and STEAM approaches in learning Renewable Energy makes a new contribution to preparing students to face real-world challenges that continue to develop. Critical thinking ability is an essential skill in facing the challenges of the 21st century, and this research shows that this approach is practical in developing it. Integrating critical thinking skills into STEAM-based learning provides essential added value in education.

### INTRODUCTION

The research explores the impact of implementing the STEAM-based Project Based Learning (PjBL) model on developing critical thinking skills in secondary school students. This study will investigate the influence of the STEAM-based PjBL model on students' critical thinking abilities through a comprehensive research approach that includes observation, interviews, and quantitative data collection (Yani & Mulia, 2023). It will also involve a long-term analysis, evaluation student creativity, and a comparison with conventional teaching methods (Syamson & Nurdin, 2021).

The research intends to provide practical recommendations for developing a STEAM-based PjBL curriculum that enhances critical thinking skills in secondary school students. This will involve measuring improvements in critical thinking skills before and after implementing the model, assessing the role of teachers in its implementation, examining the impact of learning materials on renewable energy, and determining the model's compatibility with the national curriculum (Rusmansyah et al., 2023). In summary, this research offers guidance for creating more effective educational practices that equip students with strong critical thinking skills to address the challenges of the modern world (Halim, 2022; Saphira & Prahani, 2022).

## 10. 434-Article Text-Sri.doc

### ORIGINALITY REPORT

16%

SIMILARITY INDEX

15%

INTERNET SOURCES

13%

PUBLICATIONS

3%

STUDENT PAPERS

### PRIMARY SOURCES

1	<a href="http://journal.ia-education.com">journal.ia-education.com</a> Internet Source	4%
2	<a href="http://www.researchgate.net">www.researchgate.net</a> Internet Source	2%
3	<a href="http://ejournal.undiksha.ac.id">ejournal.undiksha.ac.id</a> Internet Source	2%
4	Ummi Kalsum Harahap, Ganda Hijrah Selaras, Ardi Ardi. "Meta-Analysis of the Impact of Problem-Based Learning on High School Students' Critical Thinking Abilities in Biology Education", Journal of Digital Learning and Education, 2023 Publication	1%
5	<a href="http://jppipa.unram.ac.id">jppipa.unram.ac.id</a> Internet Source	1%
6	<a href="http://repository.radenintan.ac.id">repository.radenintan.ac.id</a> Internet Source	1%
7	Oktariyana Oktariyana, Oktariyani Oktariyani. "Application of Electronic Module Teaching Materials to Improve Student Learning	1%