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Vol.1, No.3, August 2025

Application of STEAM Learning to Enhance Students' Critical Thinking Skills

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DOI : https://doi.org/10.63230/jocsis.v1i3.77

Sections Info

Article history:
Submitted: August 11, 2025
Final Revised: August 17, 2025
Accepted: August 17, 2025
Published: August 27, 2025

Keywords:
21st Century Skills;
Critical Thinking;
Literature Review;
STEAM.

ABSTRACT

Objective: *This study aims to analyze the implementation of the STEAM (Science, Technology, Engineering, Arts, and Mathematics) learning approach in enhancing students' critical thinking skills. The urgency arises from the challenges of the Industrial Revolution 4.0 era in the 21st century, where technological advancement dominates all aspects of human life. However, Indonesia still struggles with low-quality human resources in the face of global competition. Educational reform through innovative learning approaches such as STEAM is therefore essential.* ***Method:*** *This research employed a qualitative approach with a literature study design. Data were collected from various academic sources, including books, journals, and credible scientific publications, which were then analyzed through thematic interpretation to identify the relevance and effectiveness of STEAM in fostering critical thinking abilities.* ***Results:*** *The findings reveal that the STEAM approach is practical in developing students' critical thinking skills by encouraging integrative learning that connects scientific concepts with creativity, problem-solving, and real-world applications. Students engaged in STEAM-based learning show improved reasoning, analytical ability, and adaptability, which are crucial competencies in 21st-century education.* ***Novelty:*** *This study highlights the contribution of STEAM as not only a multidisciplinary learning model but also as an innovative educational reform strategy for Indonesia. By integrating art with science and technology, STEAM offers a holistic framework to prepare students for global challenges while simultaneously strengthening critical thinking as a core competency.*

INTRODUCTION

In the era of industrial revolution 4.0 in the 21st century, all human activities are dominated by high-tech products, as if every human being cannot live without technology. This proves that advances in science and technology are developing very rapidly (Fitriyah & Ramadani, 2021). In this era, developments have a significant impact on various aspects of life, including the education system in Indonesia. Information and communication technology, as well as the boundaries between humans, machines, and other resources, have a strong influence on the education sector (Lase, 2019).

The industrial revolution 4.0 requires quality human resources with 21st-century skills, including critical thinking, creativity, collaboration, and communication abilities. However, it is unfortunate that Indonesia still has a low level of human resources, considering the overall quality of human resources, especially in the face of global competition. Quality human resources come from quality education, in the process of which students are equipped with skills to solve problems, find alternative solutions, and think critically and creatively (Maulana, 2020). One way to achieve this is by optimizing the use of technology in the learning process, so that education can adapt to current developments and contribute to improvements.

"Lifelong education" means that human life cannot be separated from education. In Law No. 20 of 2003 concerning the National Education System, character education