



## A Comprehensive Analysis of STEAM Learning Implementation to Foster Critical Thinking Skills for Equitable and Quality Physics Education in High Schools

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### ABSTRACT

**Objective:** The objective of this study is to examine the implementation of STEAM learning in enhancing the critical thinking skills of high school students in Physics, particularly in Indonesia. **Method:** The methodology consists of a literature review, which involves identifying and evaluating articles or journals related to STEAM learning and its impact on students' critical thinking in Physics. Through a systematic screening process, the initial 40 articles were narrowed down to 30, and ultimately, 20 articles were selected for detailed review. **Results:** The findings reveal that the application of STEAM learning has a significant positive effect on the critical thinking abilities of high school students with respect to Physics. **Novelty:** This approach aligns with global and national initiatives such as the Sustainable Development Goals (SDGs), highlighting the need for innovative educational programs that address contemporary challenges. In the 21st century, critical thinking, analytical skills, and creativity are essential. STEAM education – integrating science, technology, engineering, arts, and mathematics – serves as an effective strategy to equip students for future demands in education and beyond.

### INTRODUCTION

The 21st century is marked by a pressing need for quality Human Resources (HR), with an emphasis on understanding and utilizing science and technology to evaluate their impacts on the natural and social environments of communities (Usmaldi et al., 2017). In contrast, Indonesia struggles with its education quality, lagging behind many ASEAN nations. To address this issue, the Sustainable Development Goals (SDGs) program has been introduced to enhance the welfare of the population, particularly in the educational sector (Usmaldi, 2016). The government employs a strategy aimed at producing high-quality Indonesian human resources through integrated educational initiatives that focus on enhancing education quality. The SDGs are instrumental in achieving various government programs (Nurfatimah et al., 2016). Consequently, the education sector is challenged to develop students into creative, innovative, intelligent, and globally competent individuals (Suganda, 2021). To meet these expectations, students need to develop four key competencies: effective communication, collaboration with peers, critical thinking skills to address challenges, and creativity (Kurniawati, 2022).

Indonesia faces significant challenges regarding the quality of its education system, particularly when compared to other ASEAN nations. In response to these issues, the Sustainable Development Goals (SDGs) program has been implemented to enhance the welfare of the population, with a particular focus on education (Humaida et al., 2020). Specifically, SDG number 4 aims to provide inclusive, equitable, and quality education, as well as promote lifelong learning opportunities for individuals of all ages.

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