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# Energy Conservation Worksheets with Jigsaw Cooperative Learning Model to Improve Learning Outcomes Supporting SDG 4 in Science Education

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DOI : <https://doi.org/10.63230/jocsis.2.1.146>

## Sections Info

### Article history:

Submitted: May 17, 2026

Final Revised: May 24, 2026

Accepted: May 24, 2026

Published: May 25, 2026

### Keywords:

Energy Conservation;

Learning;

Science;

SDG 4;

Worksheets.

## ABSTRACT

**Objective:** To produce energy conservation worksheets based on the Jigsaw type cooperative learning model that are suitable for use and effective in improving students' science learning outcomes to support SDG point 4. **Method:** A quantitative descriptive study using the Research and Development (R&D) method, aimed at developing and testing the effectiveness of the learning product. The development process uses the ADDIE model, which includes the following stages: Analysis, Design, Development, Implementation, and Evaluation. The research population was conducted at one school with a sample of 50 students. **Results:** Research shows that Jigsaw-based cooperative learning worksheets are valid, practical, and effective for use in science learning on energy conservation in elementary schools. The implementation of worksheets can significantly improve student learning outcomes, as evidenced by pre-test, post-test, difference test, and N-Gain values in the experimental class. In addition, students responded positively to the learning because discussion activities and group collaboration made it more active, interesting, and easier to understand. **Novelty:** The innovations in this worksheet development are relevant to SDG 4, particularly in energy conservation. In the context of science education, SDG 4 implementation aims to strengthen student learning outcomes through innovative learning approaches.

## INTRODUCTION

The Sustainable Development Goals emphasize the importance of quality education that is inclusive, equitable, and able to improve students' competencies in facing the challenges of the 21st century. In the context of science education, implementing SDG 4 aims to strengthen student learning outcomes through innovative learning. Science education in elementary schools is essentially expected to equip students with an understanding of scientific concepts related to everyday life, develop scientific attitudes, and foster logical and critical thinking habits from an early age (Septiliana & Surul, 2023; Sekaringtyas et al., 2024). In fourth grade, one topic that is highly relevant to real life is energy conservation, as students begin to frequently interact with various energy sources at home and at school, such as electricity, fuel, and heat energy (Chen et al., 2020; Poimenidis et al., 2022).

The hope is that energy conservation learning will not stop at memorizing definitions, but will encourage students to understand why energy needs to be conserved, the impact of energy waste, and how to consistently implement energy-saving behaviors. Science learning is also expected to provide a space for students to actively ask questions, discuss, observe, and draw simple conclusions, so that learning outcomes are not only reflected in final grades but also in changes in thinking and attitudes toward the environment (Nur'ariyani et al., 2023).