

Implementation of Argumentation Skills in Science Education: Systematic Literature Review in the Context of Socio-Scientific Issues and SDGs

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Argumentation skills are an essential 21st-century competency that supports science literacy, conceptual understanding, and evidence based decision making. This study aims to systematically review the implementation of argumentation skills in science education, with a focus on their role in addressing socio-scientific issues (SSI) related to sustainable development. Using the PRISMA protocol, 38 articles were selected from a total of 101 articles in the Scopus and Google Scholar databases (published between 2018 and 2025) and analyzed to identify trends in learning models, topic contexts, and their contributions to the Sustainable Development Goals (SDGs). The results of the study demonstrate that the integration of argumentation with SSI is widely applied in science learning, particularly in topics such as static fluids, renewable energy, environmental pollution, and climate change. These findings suggest that SSI-based argumentation skills contribute to achieving SDG 4 (Quality Education) by strengthening 21st-century skills, SDG 7 (Affordable and Clean Energy) through renewable energy literacy, and SDG 13 (Climate Action) through critical awareness of global environmental issues. Thus, this study confirms the strategic role of argumentation in science education in supporting sustainable development at both local and international levels. Further research is recommended to expand the study to the junior high school level, develop learning interventions that explicitly train high level argument components (such as backing and rebuttal), and explore local issues as the context for SSI to strengthen the impact of education on the SDGs.

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