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Development of a Guided Inquiry-Based Biology Practicum Guidebook Integrating Scientific Literacy in Support of SDG 4: Quality Education

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DOI : <https://doi.org/10.63230/jocsis.3.2.174>



Sections Info

Article history:

Submitted: February 24, 2026

Final Revised: April 4, 2026

Accepted: June 9, 2026

First Available Online: July 19, 2026

Publication Date: June 27, 2027

Keywords:

Biology Practicum;
Guided Inquiry;
Practicum Guidebook;
Scientific Literacy;
SDGs 4.

ABSTRACT

Objective: To develop and evaluate the feasibility and practicality of a guided inquiry-based biology practicum guidebook integrating scientific literacy for Grade XI high school students. The guidebook was designed to support structured laboratory learning and contribute, at the instructional-resource level, to Sustainable Development Goal 4 by providing a quality learning resource for biology education. **Method:** Employed a research and development approach using the 4-D model modified into three stages: define, design, and develop. Data were collected through interviews, needs-analysis questionnaires, expert validation, and limited-scale trials. The developed product was assessed by material and media experts and evaluated using response questionnaires completed by two biology teachers and participating students. The quantitative data were analyzed using descriptive percentage analysis. **Results:** The material expert validation produced an average score of 98.66%, while the media expert validation reached 98%, with both categorized as very good. Teacher responses yielded an average practicality score of 93.52%, whereas student responses reached 84.53%, also within the very good category. These findings demonstrate that the guidebook is highly feasible and practical as a supporting resource for biology practicum activities. **Novelty:** To integrate guided inquiry stages, laboratory procedures, safety guidance, reporting formats, and scientific literacy tasks within a single practicum guidebook aligned with Phase F biology learning. This integrated design offers a contextual instructional resource that facilitates active investigation, evidence-based reasoning, and quality science education consistent with SDG 4.

INTRODUCTION

The development of education in Indonesia has been accompanied by continuous curriculum changes. The dynamic nature of the national curriculum reflects the efforts of educational stakeholders to adapt teaching and learning practices to societal developments and emerging educational demands (Wahjusaputri & Bunyamin, 2022). The curriculum implemented in Indonesia continues the direction of the Merdeka Curriculum, which was introduced as an improvement to the 2013 Curriculum (Efendi & Suastra, 2023). These curriculum changes influence the organization and delivery of subject content, including biology materials that require practical learning activities.

As a branch of science, biology is taught within the framework of the Merdeka Curriculum. Biology learning involves scientific facts, concepts, principles, and processes that require students to solve problems through critical thinking (Mahanal et al., 2017). Therefore, students need an accurate understanding of the biological theories and concepts introduced in classroom instruction. Learning biology involves not only acquiring knowledge about living organisms but also understanding the scientific methods used to investigate biological phenomena (Pantiwati, 2016). Consequently, biology learning cannot be separated from experimentation and laboratory practicum activities.