

link; <https://jppipa.unram.ac.id/index.php/jppipa/article/view/12068>

# Digital Literacy in Indonesian Biology Education (2020–2025): A Research Synthesis Over One Lustrum, Methodological Critique, and Strategic Roadmap

Nurul Magfirah , Anisa , Hilmi Hambali , Rahmatia Thahir , Nurdiyanti

---

## Abstract

This study systematically reviews Indonesian research on digital literacy in biology education published from 2020 to mid-2025. Using content analysis, 50 peer-reviewed articles from 17 nationally accredited biology education journals (SINTA-indexed) were examined. The findings reveal a sharp increase in publications in 2023 due to post-pandemic digital adaptation, followed by a moderate decline linked to national policy changes. Quantitative (46%) and research and development studies (42%) dominate, mainly employing static-group quasi-experimental designs. Participants are concentrated at the senior high school level (Grade 10), with underrepresentation of junior high school students, university students, and teachers. Thematically, most studies focus on biodiversity, while advanced topics like molecular biology remain underexplored. Methodologically, the use of questionnaires (70%) is prevalent, with limited adoption of interviews, observations, or test-based assessments. Descriptive statistics are primarily used, with minimal application of inferential methods such as t-tests or ANOVA. Methodological inconsistencies further hinder study replication. The study recommends diversifying research designs, expanding participant profiles, standardizing instructional terminology, and applying more rigorous analysis frameworks to support equitable and digitally adaptive biology education aligned with the Merdeka Curriculum and 21st-century competencies.

---