INTERNATIONAL JOURNAL OF LEARNING MEDIA AND NATURAL SCIENCE
2025, VOL. 2, NO. 2, 66 – 70.
DOI: 10.60005/ijlens.v2i`2.127

# Developing an Environmental Literacy-Based E-Booklet on Environmental Changes for 10th-Grade Biology Students

Ulil Azmi[a], Suraida[b], Defita Permata Sari[c], Fadli Emsa Zamani[d]

[a,b,c]Department of Biology Education, Faculty of Tarbiya and Teacher Training, UIN Sulthan Thaha Saifuddin Jambi, Indoenesia
[d]School of Artificial Intellegence & Digital Technologies, Asia e University, Malaysia

**ABSTRACT**
Biology learning resources are still largely dominated by thick textbooks that tend to be less engaging, often causing students to feel bored and struggle with understanding the material. This study employed a Research and Development (R&D) design based on the ADDIE model (Analyze, Design, Develop, Implement, Evaluate), but was limited to the Analyze, Design, and Development phases. The purpose of the research was to develop and evaluate the validity and practicality of an environmental literacy-based e-booklet on the topic of environmental changes for 10th-grade students at SMA Islam Al Falah Kota Jambi. Participants consisted of three expert validators, one biology teacher, and 30 students. Data were collected through validation sheets and teacher–student questionnaires. The results indicated an average validation score of 98.82% (very valid) and a practicality score of 92.02% (highly practical). These findings suggest that the developed e-booklet is an appropriate biology learning resource with the potential to enhance students' environmental awareness, although further testing is needed to evaluate its impact on learning outcomes.

**ARTICLE HISTORY**
Received 26th July 2025
Accepted 28th August 2025

**KEYWORDS**
E-booklet, Environmental literacy, Environmental changes, Practicality, Validity

## Introduction

Biology is a branch of science that is closely connected to daily life, thereby requiring a strong link between theory and practice in its learning process (Campbell et al., 2019). However, students often experience boredom when learning biology due to the dominance of lengthy, text-heavy textbooks that lack sufficient illustrations. This situation leads to low levels of interest and motivation (Nurlia et al., 2024). One biological topic that requires contextual understanding is environmental change, which encompasses both global and local issues such as air pollution, water pollution, deforestation, and climate change (Moon & Blackman, 2014; Aini & Habibi, 2020).

To foster students' awareness of environmental protection, concise and engaging learning media that are aligned with technological advancements are needed (Mdhlalose, 2023). E-booklets offer an effective alternative by combining concise text with appealing visualizations (Erawati & Susanti, 2022; Umami & Rahayu, 2024). Compared to printed resources, e-booklets are more accessible on digital devices, easier to update, and environmentally friendly (Meyers et al., 2013). When developed with an environmental literacy perspective, e-booklets not only deliver content but also instill values of environmental responsibility (Nurlia et al., 2024). Previous studies have shown that booklets enhance conceptual understanding when supported by illustrations and simple language (Meyers et al., 2013; Aini & Habibi, 2020; Mdhlalose, 2023).

This study was conducted at SMA Islam Al Falah Kota Jambi. The practicality of the developed e-booklet was examined through responses from both teachers and students. While earlier studies have highlighted the general benefits of e-booklets, research that specifically integrates environmental literacy into their design remains limited. Therefore, this study aimed to develop an environmental literacy-based e-booklet on environmental changes for 10th-grade biology students, evaluate its validity, and assess its practicality based on teacher and student responses.

## Methods

This study employed a Research and Development (R&D) approach based on the ADDIE model (Sugiyono, 2019). Although ADDIE consists of five stages, this research was limited to the first three: Analyze, Design, and Development. The Implementation and Evaluation stages were not carried out.

CONTACT Ulil Azmi. email: ulilazmi682@gmail.com, Faculty of Tarbiya and Teacher Training, UIN Sulthan Thaha Saifuddin Jambi, Indoenesia, Faculty of Tarbiya and Teacher Training, Department of Biology Education, Jalan Conge Ngembalrejo Kudus.

### *Participants*

The participants included three expert validators (specializing in content, language, and design), one biology teacher, and 30 10th-grade students from SMA Islam Al Falah Kota Jambi.

### *Procedures*

- Analyze: Interviews with teachers and students were conducted to identify learning challenges. The findings highlighted the need for concise, engaging resources that reflect local environmental contexts.
- Design: The e-booklet structure was planned, including content, learning objectives, and visual elements such as layout, typography, and illustrations.
- Development: The initial draft of the e-booklet was created, incorporating case studies (e.g., river pollution and forest burning in Jambi), and subsequently revised based on expert feedback.

### *Instruments*

- Validation sheets: Consisting of 15 items covering content, language, and design, assessed using a 5-point Likert scale (1 = very poor, 5 = excellent).
- Teacher and student questionnaires: Each consisted of 10 items rated on a 4-point Likert scale (1 = strongly disagree, 4 = strongly agree).
- All instruments were adapted from Puspita et al. (2017) and reviewed for content validity by two senior lecturers prior to use.

Data analysis. Descriptive percentages were used to categorize validity and practicality:

**Table 1. Categories of E-Booklet Teaching Material Validation**

| Percentage % | Category |
|---|---|
| 80-100 | Very valid |
| 66-79 | Valid |
| 56-65 | Quite valid |
| 40-55 | Less valid |
| 30-39 | Invalid |

Source: Puspita et al. (2017)

To calculate the validation score from each validator, the researcher used the following formula:

$$\text{Validation Score} = \frac{\text{Maximum Score}}{\text{ScoreScore Obtained}} \times 100\%$$

The practicality test was conducted to assess how practical the e-booklet teaching material is. The researcher asked teachers and students to evaluate the practicality of the e-booklet. The range of practicality scores is as follows:

**Table 2. Categories of E-Booklet Learning Resource Validation**

| Precentage % | Category |
|---|---|
| 80-100 | Very practical |
| 66-79 | Practical |
| 56-65 | Faerly Practical |
| 40-55 | Less Practical |
| 30-39 | Impractical |

Source: Puspita et al. (2017)

To calculate the average score of respondents in the practicality test, the researcher used the following formula:

$$X = \frac{\sum X}{N}$$

Description: X = Average score of respondents
∑X = Total score of all instruments
N = Number of respondents

## Results and Discussions

The development of the environmental literacy-based e-booklet resulted in a product that has been validated and revised based on expert feedback. The following presents the results of the product validation and practicality.


Figure 1. Before Revision


Figure 2. After Revision

**Table 3. Expert Validation Results**

| Aspeck | Persentage | Category |
|---|---|---|
| Material | 99% | Very Valid |
| Language | 98% | Very Valid |
| Design | 99.5% | Very Valid |
| Average | 98,82% | Very Valid |

**Tabel 2. Hasil Uji Kepraktisan**

| Respondent | Persentage | Category |
|---|---|---|
| Biology Teacher | 93.33% | Very Practical |
| Students | 91.21% | Very Practical |
| Average | 92.02% | Very Practical |

### *Content Validity*

The validation process showed that the content of the environmental literacy-based e-booklet achieved a score of 99%, indicating strong alignment with the revised 2013 curriculum and scientific accuracy. The inclusion of contextual case studies, such as river pollution and forest burning in Jambi, further enhanced the material's relevance, allowing students to connect theoretical knowledge with local environmental issues more effectively. This contextualization not only supported cognitive understanding but also fostered affective awareness. This finding aligns with Aini and Habibi (2020), who demonstrated that embedding local issues into instructional media significantly increases student engagement and awareness of environmental challenges.

### *Language Validity*

The language aspect received a score of 98%, showing that the e-booklet employed clear, concise, and communicative wording that minimized student confusion. The use of accessible terminology, consistent sentence structure, and grammatically correct Indonesian enabled students to learn independently without requiring extensive teacher guidance. As emphasized by Mdhlalose (2023), clarity in scientific language is essential for facilitating the comprehension of complex ideas. The high language validity indicates that the e-booklet effectively balanced accuracy with accessibility an element often overlooked in conventional biology textbooks, which tend to be text-heavy and difficult for students to process.

### *Design Validity*

The design component achieved the highest score at 99.5%, underscoring the essential role of visual presentation in digital learning resources. Expert validators highlighted that revisions—such as reducing text density, incorporating contextual illustrations, and ensuring consistency in layout and typography—substantially improved readability and visual appeal. Figures 1 and 2, which show the product before and after revision, visually confirm these improvements. These findings resonate with Meyers et al. (2013), who argued that effective design is not merely supplementary but a core determinant of student motivation and attention. Nevertheless, potential validator bias should be considered, as experts familiar with the local educational context may have been predisposed to view the product positively. Even so, the systematic revisions based on expert feedback provide evidence that the final version genuinely improved in quality.

### *Practicality Test*

The practicality assessment yielded an overall score of 92.02%, with teachers rating the product at 93.33% and students at 91.21%. Teachers noted that the e-booklet simplified lesson delivery by providing systematically organized material supported by visuals, which helped reduce the abstractness of environmental concepts (Roisatulkusna, 2024). Students reported that the e-booklet was easy to use, visually engaging, and motivating. They particularly appreciated the contextual examples, which made the material feel more relevant to their lived experiences. These findings suggest that the e-booklet functioned not only as an instructional tool but also as a medium for cultivating interest and motivation in learning biology (Hasibuan et al., 2025; Wulandari et al., 2025).

Although the practicality scores reflected high levels of acceptance, the study was limited to a single school, one teacher, and 30 students, which restricts the generalizability of the results. It remains uncertain whether similar responses would emerge in schools with different demographics, resources, or teaching practices. Thus, while the results are promising, broader testing is needed to confirm the e-booklet's usability across more diverse educational contexts. Beyond its practical utility, the e-booklet also served as a tool for fostering environmental literacy in a holistic manner (Nursa'adah et al., 2021). By integrating scientific knowledge with local case studies and accessible design, the product addressed cognitive, affective, and psychomotor dimensions of environmental awareness, echoing Nurlia et al.'s (2024) view that instructional media should influence both knowledge and behavior. However, this study did not measure the e-booklet's direct impact on academic achievement, critical thinking, or behavioral change. Future research should address these gaps by examining whether the e-booklet can significantly influence learning outcomes and long-term environmental attitudes.In conclusion, the e-booklet demonstrated high validity across content, language, and design, with design emerging as the strongest aspect due to revisions that substantially improved readability and appeal. Its practicality ratings also confirm its suitability as a learning resource that can engage both teachers and students. While these results validate the product's potential, they also highlight the need for further evaluation in broader contexts and with more rigorous outcome measures. The study underscores the importance of combining contextualized content, clear language, and strong design principles in developing digital media that not only convey knowledge but also nurture environmental literacy among students.

Based on the results, the e-booklet demonstrated high validity across content, language, and design, with design emerging as the strongest aspect due to revisions that substantially improved readability and visual appeal. Its practicality ratings further confirm its suitability as a learning resource capable of engaging both teachers and students. While the results validate the product's potential, they also highlight the need for further evaluation in broader contexts and with more rigorous outcome measures. Overall, the study underscores the importance of combining contextualized content, clear language, and strong design principles in developing digital media that not only convey knowledge but also nurture environmental literacy among students.

## Conclusions

The developed environmental literacy based e-booklet demonstrated high validity, with an average score of 98.82%, and high practicality, with an average score of 92.02%. These results indicate that the product is feasible for use as a biology learning resource on the topic of environmental change for 10th-grade senior high school students. Beyond delivering biological concepts, the e-booklet also serves as a medium for fostering environmental literacy values, thereby supporting both cognitive understanding and the cultivation of environmental awareness.

## Acknowledgment

The authors would like to express sincere gratitude to the supervisors, expert validators, teachers, and high school students in Jambi City who have contributed to this research.

## References

Aini, C. N., & Habibi, M. W. (2020). Development of booklet based science learning media for Junior High School. *INSECTA: Integrative Science Education and Teaching Activity Journal*, *1*(2), 155-167. https://doi.org/10.21154/insecta.v1i2.2269

Campbell, N. A., Urry, L. A., Cain, M. L., Wasserman, S. A., Minorsky, P. V., & Reece, J. B. (2019*). Biology (11th ed.)*. New York: Pearson.

Erawati, A., & Susanti, L. Y. (2022). Development of E-Booklet learning media in the topic of environmental pollution for junior high school students. *Indonesian Journal of Mathematics and Natural Science Education*, *3*(2), 96-106. https://doi.org/10.35719/mass.v3i2.82

Hasibuan, E. G. E., Destrinelli, D., & Zahyuni, V. (2025). Development of a Canva-based e-booklet for geometry learning in elementary school students. *Asatiza: Jurnal Pendidikan*, *6*(1), 48-62. https://doi.org/10.46963/asatiza.v6i1.2579

Nurlia, N., Ristiana, E., & Aulia, K. (2024). Environmental literacy of biology education students. *Jurnal Pendidikan Glasser, 8*(1), 123-128. https://doi.org/10.32529/glasser.v8i1.3230

Mdhlalose, D. (2023). Integration of Technology in Education and its Impact on Learning and Teaching. Asian Journal of Education and Social Studies, 47(2), 10-9734.

Moon, K., & Blackman, D. (2014). A guide to understanding social science research for natural scientists. *Conservation biology*, *28*(5), 1167-1177. https://doi.org/10.1111/cobi.12326

Meyers, E. M., Erickson, I., & Small, R. V. (2013). Digital literacy and informal learning environments: an introduction. *Learning, media and technology, 38*(4), 355-367. https://doi.org/10.1080/17439884.2013.783597

Nursa'adah, E., Maryani, B., & Ruyani, A. (2021). Students' environmental literacy: Environment education assisted e-booklet on biodiversity Gegas Dam Indonesia context. *Thabiea: Journal of Natural Science Teaching*, *4*(2), 159-169.

Roisatulkusna, N. (2024). Development of an integrated e-booklet I-SETS (Islamic, Science, Environment, Technology, and Society) Environmental Change Material For Class X SMA/MA Students. *QUANTUM*, *15*(1), 39-52.

Sugiyono. (2019). *Educational Research Methods: Quantitative, Qualitative, and R&D Approache*s. Bandung: Alfabeta.

Umami, H., & Rahayu, E. S. (2024). Development of e-Booklets making nata de pina as a learning resource for Biology Technology Innovation material in the Merdeka Phase E curriculum in high school. *Jurnal Penelitian Pendidikan IPA*, *10*(10), 7209-7219. https://doi.org/10.29303/jppipa.v10i10.9476

Wulandari, S., Sukamto, D. S., & Putri, H. R. (2025). Development of an E-Booklet Utilizing Endophytic Fungi Isolated from Phalaenopsis amabilis Roots to Enhance Learning Outcomes on Kingdom Fungi Material. *Prisma Sains: Jurnal Pengkajian Ilmu dan Pembelajaran Matematika dan IPA IKIP Mataram*, *13*(3), 402-415. https://doi.org/10.33394/j-ps.v13i3.15182