



Interactive E-book Peat Ecosystem on Science Learning in Junior High School

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| Article Info | Abstract |
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| Article History : Received Accepted Published | Science learning on global warming and climate change integrated with Socio Scientific Issues of peat ecosystems is needed to increase students' knowledge of the environment. Learning uses interactive e-books that contain material in the form of text, images, and videos. This study aims to describe: (1) Validation of media and material experts; (2) Teacher's response; (3) Student response. The research subjects were two science teachers and 20 seventh-grade students at SMPN 5 Palangka Raya, Central Kalimantan. The validity based on material and media experts is 91.2% on average, with very good criteria. The teacher's response to interactive e-books is in the 86.25% category with very good criteria. The average student response to interactive e-books is 78%, with a very good criteria. It can be stated that the interactive E-book developed is valid and can be used in science learning. |
| Keywords: Interactive E-book, Science Learning, Peat ecosystem media | |

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INTRODUCTION

Indonesia has 27 million hectares of peatland (12%) spread over Kalimantan, Sumatra and Papua and is the largest peat area in Southeast Asia (Dohong et al., 2018; Husson et al., 2018). Peat has an important function as a carbon sink, water buffer, unique flora and fauna living place and as a source of livelihood for the surrounding community (Ramdhan & Siregar, 2018). The area of peat in Indonesia decreases every year due to land conversion and forest fires.

Improper peat management causes peat soil to dry out. Dry peat will lose its water absorption, so it is hydrophobic. It causes the peat to burn during the dry season and cannot hold water during the rainy season, resulting in flooding. Forest and land fires that occurred in 2015 and 2019 due to the clearing of peatlands became the largest source of greenhouse gas emissions in the world (Noor, 2019).

The environmental impact of peat forest fires and land conversion is severe for global warming and climate change. The participation of the community is needed to overcome environmental problems through the world of education. Science learning in schools at KD 3.9 Understanding climate change and its impact on ecosystems integrated with socio-scientific issues regarding peat ecosystems. SSI is a suitable method for presenting environmental issues in peat ecosystems. The SSI approach in science learning provides an understanding of learning materials by reviewing an issue or a learning topic from various points of view (Genisa et al., 2020; Kabatas Memis & Ezberci Cevik, 2017; Nida et al., 2020).

The integrated science learning of Socio Scientific Issues of the peat ecosystem in learning uses interactive media that aims to represent the peat ecosystem in real for students. Interactive media in the form of e-books contain text, images, videos, animations, and audio so that students have control over the media in the learning process (Tsvyatkova & Storni, 2019). Interactivity in e-books is connected with links that make it easy to access

online materials and quizzes connected to Google Classroom (Sri et al., 2021).

This study aims to determine the effectiveness of using interactive e-books in science learning based on: (1) Validation of media and material experts; (2) Teacher's response; (3) Student response. Interactive e-book media is expected to increase students' awareness and proactivity to preserve the environment.

METHODS

This research is an integrative e-book development with R&D stages adapted from Borg & Gall (Sugiyono, 2012). The effectiveness of e-books is measured based on the results of expert validity, student and teacher responses to interactive e-books. The research subjects were one material expert lecturer, one media expert lecturer, seven class VII-4, and two science teachers at SMPN 5 Palangka Raya. Data collection instruments in the form of expert validation questionnaires, student response questionnaires, and teacher response questionnaires.

The expert validity instrument uses a Likert scale with four categories: 1 (very poor), 2 (poor), 3 (good), 4 (very good). Questionnaire of teacher and student responses to interactive e-books using a Likert scale with categories: 1 (strongly disagree); 2 (disagree); 3 (agree); 4 (strongly disagree).

The first step is research and data collection in literature studies and field studies on students and interviews with science teachers. The second stage is the writing and design of the e-book. The third stage is developing e-books using the Flip PDF Professional application to facilitate interactive features on conventional e-books by adding multimedia in the form of audio, video, and images that can be accessed directly by students when opening e-books (Sri et al., 2021). The next stage is the validation of material and media experts. The trial of e-books and responses to e-books on ten students of class VIII-4 and two teachers at SMPN 5 Palangka Raya. Analysis of data validity and response to the use of e-books using the

percentage technique and described by category. The validity criteria and response

questionnaires are in Table 1.

Table 1. Category Data Validity and Response

| Data | Percentage | Category |
|----------|---------------|------------|
| Validity | 81.26 – 100 | Very Valid |
| | 62.51 – 81.25 | Valid |
| | 43.76 – 62.50 | Not valid |
| | 25.00 – 43.75 | Invalid |
| Response | 81.26 – 100 | Very Valid |
| | 62.51 – 81.25 | Valid |
| | 43.76 – 62.50 | Not valid |
| | 25.00 – 43.75 | Invalid |

RESULTS AND DISCUSSION

Interactive Ebook Validity

The assessment of material and media experts is under the feasibility and visual assessment components by the National

Education Standards Agency (BSNP), adapted to development needs (Table 2). Indicators in assessing the SSI aspect of the peat ecosystem represent the nature of SSI, which has a scientific basis and is related to people's lives (Presley et al., 2013; Zulkarnaini et al., 2020).

Table 2. Material and Media Validity Assessment Indicators

| Assesment | Aspec | Indicator |
|-----------------------|-------------------------|--|
| Material | Content | The suitability of the material with KD |
| | | Material accuracy |
| | | Material up-to-date |
| | | Encourage curiosity |
| | Presentation | Presentation technique |
| | | Serving support |
| | | Presentation of learning |
| | | Coherence and coherence in the flow of thought |
| | Language | Straightforward |
| | | Communicative |
| | | Dialogic and interactive |
| | | Suitability with student development |
| | Socio Scientific Issues | Conformity with language rules |
| | | Criteria for Topic Socio Scientific Issues |
| Media | Content | The nature of socio scientific issues |
| | | Book conformity with ISO standard |
| | Cover Design | Conformity of content with material |
| | | Compatibility of cover appearance with content |
| E-book Content Design | | Harmonious element color |
| | | Letter legibility |
| | | Layout consistency |
| | | Layout harmonization |
| | | Simple typography |
| | | Compatibility Illustration content with material |

The validity of the SSI Integrated Global Warming and Climate Change interactive E-book was assessed by material expert validators and media experts by filling out a

questionnaire. The expert assessment aims to determine whether the media can be used in learning. The results of the validation are in Table 3.

Table 3. Percentage Validity and Criteria

| Expert | Rated Aspect | Percentage | Criteria |
|------------------|-------------------------|------------|------------|
| Science Material | Content | 91.7 | Very Valid |
| | Presentation | 95 | Very Valid |
| | Languange | 91.7 | Very Valid |
| | Socio Scientific Issues | 96.4 | Very Valid |
| Media | Content | 100 | Very Valid |
| | Cover Design | 89.3 | Very Valid |
| | Ebook Content Design | 75 | Valid |
| Average | | 91.2 | Very Valid |

The validity of the SSI integrated interactive e-book on the peat ecosystem based on the average assessment of the material, and media experts are in the very valid category to supplement teaching materials in science learning. Interactive e-books change the paradigm of digital books in textbooks and are converted into digital forms, but make e-books more flexible and interactive (Way, 2016).

The factors that support the high validity of SSI integrated interactive e-books on peat ecosystems include 1. The presentation of images is the result of direct observations to represent the actual peat environment for

readers (figure 1); 2. The e-book is equipped with supporting components in the form of: “Info at a glance,” which displays trivia related to learning materials and information related to peat ecosystems; “Student activity” is a topic of discussion and practicum for students; The “information corner” displays a YouTube video link in the form of an SSI on peat ecosystems and the impact of global warming (Figure 2). 3. The interactive feature can provide an exciting learning experience with multimedia that can be accessed directly through offline or online e-books.



Figure 1. Image display of peat forest in Palangka Raya, Central Kalimantan



Figure 2. Additional components in interactive e-books

The interactive features in the e-book are

1. the display of the book that can be flipped like a printed book;
2. Zoom button to enlarge the view of pages and photos;
4. Play button in

- the information corner to play the video;
5. Practice questions that can directly display student scores (Figure 3).

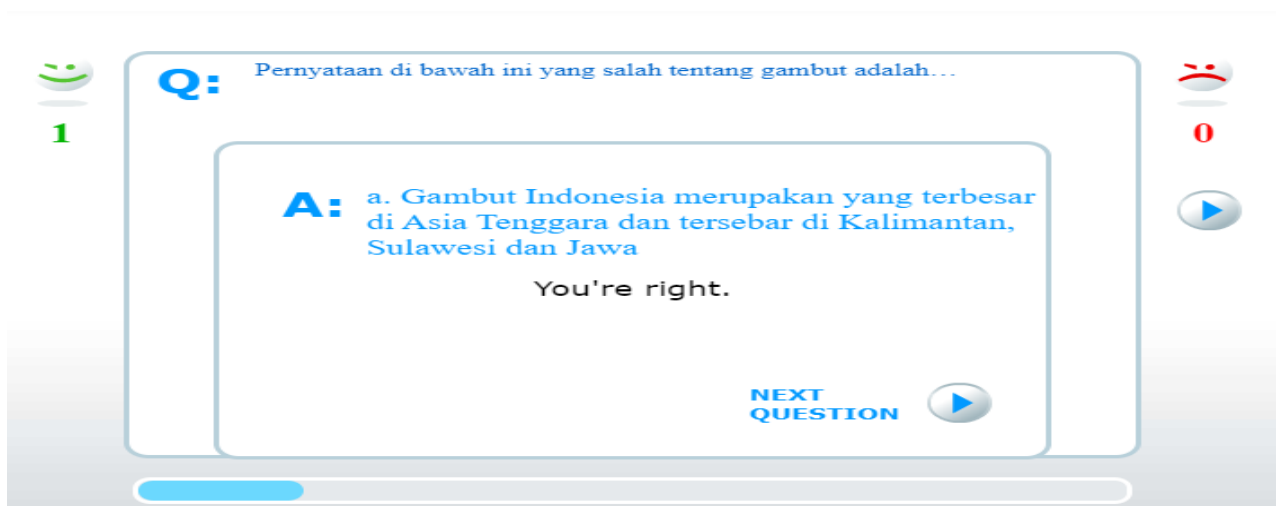


Figure 3. Practice questions features

The validity of the e-book based on the assessment of material experts is in the very high category because it presents concrete examples in an area related to global warming material. Presley et al. (2013) stated that SSI learning using media could connect and facilitate classroom learning with the actual situation. The SSIs presented in the e-book include

1. Forest and land fires;
2. The conversion of peatland into plantations and food estates;
3. The role of peat in global

- warming;
4. Efforts to preserve the peat ecosystem.

The interactive e-book integrated with SSI's peat ecosystem is expected to motivate students to understand global warming. Interactive e-books act as teaching materials and learning media. Pictures, graphics, data, videos, and phenomena presented in the e-book are expected to facilitate students' understanding of the material on global warming and climate change. They manifest in attitudes and behavior towards the environment.

Teacher and Student Responses to Interactive e-books

The response is an assessment made by teachers and students on interactive e-books after learning. Responses are used to identify errors and weaknesses contained in the e-book.

The aspects assessed are presentation, content, language, and feasibility. The teacher's response on average is 86.25%, with very good criteria. The average student response of 78% is in the very good criteria (Table 4).

Table 4. Percentage of Responses and Criteria

| Response | Rated Aspect | Percentage | Criteria |
|----------|-----------------|------------|-----------|
| Teachers | Presentation | 87.5 | Very good |
| | Contents | 87.5 | Very good |
| | language | 70 | Well |
| | Appropriateness | 100 | Very good |
| Students | Presentation | 76.9 | Well |
| | Contents | 75 | Well |
| | language | 82.5 | Very good |
| | Appropriateness | 77.5 | Very good |

Assessment indicators: Teacher response between the presentation of material, illustrations, interactive features, and content conformity with KI and KD. The language that is easy to understand and the feasibility of using interactive e-books in learning. Tsvyatkova & Storni (2019) stated that interactive e-books are easily accessible media for self-study and learning together. On average, the teacher's response to interactive e-books is in very good criteria so that interactive e-books become media that can be used in science learning.

Etta & Kirkorian (2019) stated that interactivity in e-books should be simple and not interfere with understanding the learning material. Indicators for assessing student responses include 1. Presentation of pictures, illustrations, and interactive features; 2. The suitability of the material and concept of SSI with the facts; 3. Use of clear and compelling language; 4. The role of interactive e-books in learning. Students' responses to learning media are influenced by presenting material using communicative language (Ma'rufah et al., 2021). Communicative and effective language makes it easier to understand the concepts and materials contained in the e-book.

Presentation of material using pictures, relevant illustrations, and interactive features

can attract students' interest in learning. In line with Herianto & Wilujeng's (2020) statement, indicators in developing interactive e-books: (1) material arrangement; (2) easy-to-understand material; (3) and attractive colors.

Based on the study results, it can be concluded that the interactive e-book of the peat ecosystem is effectively used in science learning. The validity based on material and media experts is 91.2% on average, with very good criteria. On average, the teacher's response to interactive e-books is in the 86.25% category with very good criteria. The average student response to interactive e-books is 78%, with a very good criteria.

CONCLUSION

Based on the study results, it can be concluded that the interactive e-book of the peat ecosystem is effectively used in science learning. The validity based on material and media experts is 91.2% on average, with very good criteria. On average, the teacher's response to interactive e-books is in the 86.25% category with very good criteria. The average student response to interactive e-books is 78%, with a very good category.

REFERENCES

- Dohong, A., Abdul Aziz, A., & Dargusch, P. (2018). A Review of Techniques for Effective Tropical Peatland Restoration. *Wetlands*, 38(2), 275–292.
- Etta, R. A., & Kirkorian, H. L. (2019). Children’s learning from interactive eBooks: Simple irrelevant features are not necessarily worse than relevant ones. *Frontiers in Psychology*, 9(JAN), 1–11.
- Genisa, M. U., Subali, B., Djukri, Agussalim, A., & Habibi, H. (2020). Socio-scientific issues implementation as science learning material. *International Journal of Evaluation and Research in Education*, 9(2), 311–317.
- Herianto, & Wilujeng, I. (2020). Students and teachers’ necessity toward science interactive multimedia e-books based on local potential of gamelan to increase students’ curiosity. *Journal of Physics: Conference Series*, 1440(1).
- Husson, S. J., Limin, S. H., Adul, Boyd, N. S., Brousseau, J. J., Collier, S., Cheyne, S. M., D’Arcy, L. J., Dow, R. A., Dowds, N. W., Dragiewicz, M. L., Ehlers Smith, D. A., Iwan, Hendri, Houlihan, P. R., Jeffers, K. A., Jarrett, B. J. M., Kulu, I. P., Morrogh-Bernard, H. C., ... Harrison, M. E. (2018). Biodiversity of the sebangau tropical peat swamp forest, Indonesian Borneo. *Mires and Peat*, 22, 1–50.
- Kabatas Memis, E., & Ezberci Cevik, E. (2017). Examination of Students’ Small Groups Discussion in Argumentation Process: Scientific and Socio-Scientific Issues. *Journal of Education in Science, Environment and Health*, 3(2), 126–126.
- Muhimmatun Ma’rufah, D., Ngabekti, S., & Setiati, N. (2021). Development of Socioscientific Issues-Based Teaching Materials to Improve Learning Outcomes and Students’ Environment Careness on The Environmental Changing Material. *Journal of Innovative Science Education*, 9(3), 87–94.
- Nida, S., Rahayu, S., & Eilks, I. (2020). A survey of Indonesian science teachers’ experience and perceptions toward socio-scientific issues-based science education. *Education Sciences*, 10(2), 1–15.
- Noor, M. (2019). *Kebakaran Lahan Gambut*. UGM Press.
- Presley, M. L., Sickel, A. J., Muslu, N., & Merle-, D. (2013). A framework for socio-scientific issues based education. *Science Educator*, 22, 26–32.
- Ramdhan, M., & Siregar, Z. A. (2018). Pengelolaan Wilayah Gambut Melalui Pemberdayaan Masyarakat Desa Pesisir Di Kawasan Hidrologis Gambut Sungai Katingan Dan Sungai Mentaya Provinsi Kalimantan Tengah. *Jurnal Segara*, 14(3), 145–157.
- Sri, A., Sianturi, R., Retnoningsih, A., Ridlo, S., & Semarang, U. N. (2021). Journal of Innovative Science Education Development of Interactive E-Book of Ferns Materials Through a Scientific Approach With Hots Problems to Improve Student Learning Outcomes. 10(37), 230–236.
- Sugiyono. (2012). *Metode Penelitian Kuantitatif Kualitatif dan R&D*. Alfabeta.
- Tsvyatkova, D., & Storni, C. (2019). Designing an educational interactive eBook for newly diagnosed children with type 1 diabetes: Mapping a new design space. *International Journal of Child-Computer Interaction*, 19, 1–18.
- Way, T. (2016). An improved approach for interactive ebooks. *Annual Conference on Innovation and Technology in Computer Science Education, ITiCSE*, 11-13-July, 248–249.
- Zulkarnaini, Meiwanda, G., Lubis, E. E., Nasution, M. S., & Habibie, D. K. (2020). Peatland Management Based on Education for Sustainable Development (ESD). *Journal of Physics: Conference Series*, 1655(1).