



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

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### **Abstract**

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.

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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 (Tsvyatkov & 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
		Harmonious element color
	E-book Content Design	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).

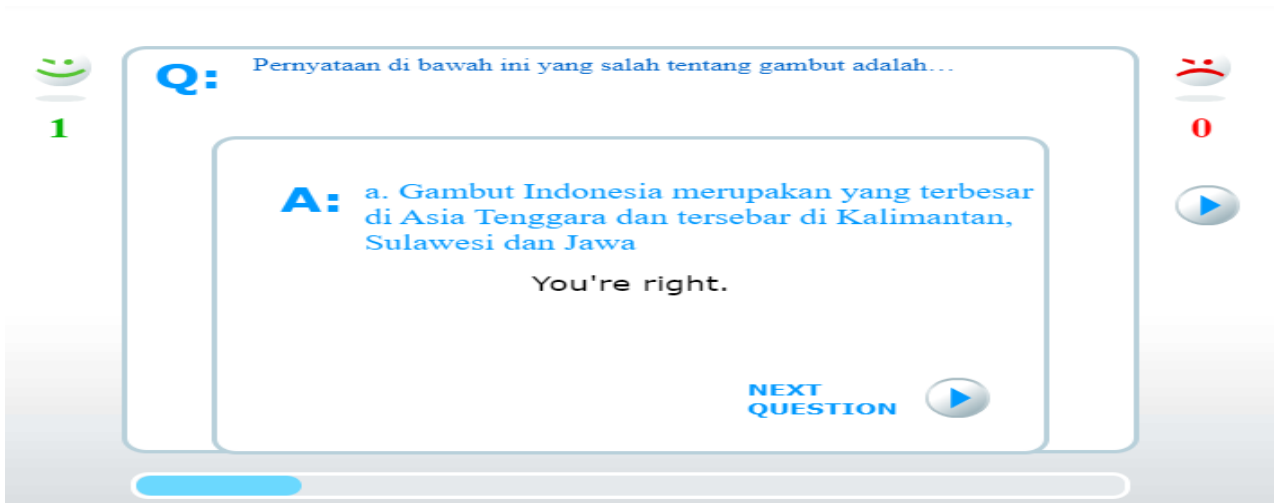


Figure 3. Practice questions features

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. Tsvyatкова & 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 colours.

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

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