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THE DEVELOPMENT OF INTERACTIVE E-BOOK ON ECOSYSTEM TOPIC TO TRAIN DIGITAL LITERACY OF 10TH GRADE SENIOR HIGH SCHOOL STUDENTS

Pengembangan E-book Interaktif pada Materi Ekosistem untuk Melatihkan Literasi Digital Peserta Didik Kelas X SMA

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Abstract

One of abilities that 2013 Revised Curriculum demands is digital literacy skills. The results of Kominfo survey shows that digital literacy level of East Java high school students is low. One of media that can train digital literacy is an interactive electronic book. Biology learning at SMA Negeri 1 Tarik never use interactive e-books. Therefore, it's necessary to develop interactive e-book to train students' digital literacy. The aims of this research are 1) to produce a valid interactive e-book on ecosystem topic to train digital literacy, and 2) to describe the practicality of interactive e-book on ecosystem topic to train digital literacy. This research was a development research used the ADDIE model (Analyze, Design, Development, Implementation, and Evaluation). The parameters assessed include the level of validity based on aspects of presentation, content, and language and the practicality based on the implementation of the e-book, exercises scores, and response student questionnaires. Validity assessed by two material experts and one Biology teacher. The level of practicality of e-book was tested on 20 students of SMA Negeri 1 Tarik. Descriptive quantitative data analysis. The results showed that 1) the level of validity of e-book got 97.50% with very valid interpretation and 2) the level of practicality of e-book in terms of the implementation of the e-book got 97.08% with very well implemented and practical category, based on the exercises scores got 100% Complete with very practical category, and in terms of student response questionnaire got 97.20% with very practical interpretation.

Keywords: interactive e-book, ecosystem topic, digital literacy

Abstrak

Salah satu kemampuan yang menjadi tuntutan Kurikulum 2013 Revisi adalah kemampuan literasi digital. Hasil survey Kominfo menunjukkan bahwa tingkat literasi digital siswa menengah Jawa Timur masih tergolong rendah. Salah satu media yang dapat melatihkan literasi digital adalah electronic book interaktif. Pembelajaran Biologi di SMA Negeri 1 Tarik belum pernah memanfaatkan e-book interaktif. Oleh sebab itu, perlu adanya pengembangan e-book interaktif untuk melatihkan literasi digital bagi peserta didik. Tujuan dari penelitian ini adalah untuk 1) menghasilkan produk e-book interaktif pada materi ekosistem yang valid untuk melatihkan literasi digital, 2) mendeskripsikan kepraktisan e-book interaktif pada materi ekosistem untuk melatihkan literasi digital. Penelitian ini merupakan penelitian pengembangan dengan model ADDIE (Analyze, Design, Development, Implementation, dan Evaluation). Parameter yang dinilai meliputi tingkat validitas berdasarkan aspek penyajian, isi, dan bahasa serta kepraktisan berdasarkan keterlaksanaan penggunaan e-book, skor latihan soal, dan angket respon. Validitas dinilai oleh dua ahli materi dan satu guru Biologi. Tingkat kepraktisan e-book diuji cobakan kepada 20 peserta didik SMA Negeri 1 Tarik. Analisis data secara deksriptif kuantitatif. Hasil penelitian menunjukkan bahwa 1) tingkat validitas e-book mendapatkan skor 97,50% dengan interpretasi sangat valid dan 2) tingkat kepraktisan e-book ditinjau dari keterlaksanaan penggunaan e-book mendapatkan skor 97,08% dengan kategori terlaksana

dengan sangat baik dan praktis, berdasarkan skor latihan mendapatkan skor 100% Tuntas dengan kategori sangat praktis, serta ditinjau dari angket respon peserta didik mendapatkan skor 97,20% dengan interpretasi sangat praktis.

Kata kunci: *E-book interaktif, materi ekosistem, literasi digital*

INTRODUCTION

The world of education has entered an era of disruption called 21st Century Education. 21st century education demands output that can master 21st century skills known as 4C. 4C includes critical thinking, creative thinking, communication, and collaboration skills (National Education Association, 2012). This is in line with the demands of the 2013 Revised Curriculum where learning is required to be student-centered learning, to train 21st century skills, and to optimize the integration of technology in the learning process. One of the skills that need to be trained in integrating technology in the learning process is digital literacy.

Digital literacy is defined as a person's ability to use digital media, information tools, or networks to search, interpret, implement, and create information wisely, intelligently, and comply with the law with the aim of communicating and interacting (Kemendikbud GLN Team, 2017). Indonesia is the sixth largest internet user country in the world with 25,5 million users. This is both an opportunity and a challenge for the Indonesian people. Opportunities that can be taken are to make it easier for teachers to train digital literacy for students who are already familiar with digital media. However, the challenge for the Indonesian people is to provide access to information, especially educational information with qualified, valid and relevant quality. In line with the results of the Kominfo survey (2020) which states that the digital literacy score of the people of East Java is less than 3.00 in the less category. This is supported by research by Raharjo and Winarko (2021) which states that the level of digital literacy of the millennial generation in the city of Surabaya is generally in the low category index.

Based on the results of the Kominfo survey and the research above which states that the literacy level is still in the poor and low category, it is necessary to hold a new movement to improve student literacy. The low level of student literacy is caused by several factors such as lack of access to information, especially in remote areas; the learning environment and atmosphere do not support the meaning of reading where the teacher is still the only source of learning; learning is not contextual so that students have not been able to relate the phenomena that occur around it with the concepts that have been learned; as well as the selection of monotonous teaching materials that do not increase motivation to read them (Fuadi et al., 2020). One of the breakthroughs that can be considered is the use of teaching materials such as interactive electronic books. This is supported by the results of interviews with the students and biology teacher of SMA Negeri 1 Tarik who stated that they had never used interactive e-books in Biology subject.

Electronic books are a product development of textbooks from paper-based to computer-based (Sanuaka et al., 2017). E-books are said to be interactive if there are two-way interaction between the students and the books. The interactive aspect is supported by the presentation of content in the form of text, images, video, audio, animation, and hyperlinks that are directly connected to search engines. This provide feedback to the user's response to e-books such as pressing feature buttons and opening digital book's sheets. This interactive activity is able to increase student motivation and improve learning outcomes (Kurniawati & Nita, 2018).

Interactive e-books are closely related to train digital literacy. Interactive e-books will increase students' motivation in reading the material because of the feedback from the book on student responses. The use of digital books can also train students' digital literacy skills with indicators including internet searching, hypertextual navigation, knowledge assembly, and content evaluation (Gilster, 1997). The digital literacy indicators can be included in the features of the e-book so that the e-book can be a learning medium that is able to train digital literacy skills for students. This is in line with Muhammad and Ambarwati (2020), the e-book was stated to be effective in train students' digital literacy with score 0.7 in the high category. One material that is suitable to be presented using an interactive e-book is ecosystem topic.

Ecosystem topic ideally supported by real observations in the surrounding environment, not just rote memorization without accompanied by a proper understanding of the concept. However, the reality on the class shows that there are students' limitations in observing ecosystem materials such as ecosystem types, interaction patterns of ecosystem components, and biogeochemical cycles. To overcome these limitations, the solution that can be considered is students can observe these topics through pictures, videos, and articles that are contextual and contain phenomena that occur in daily life. (Sadikin and Hakim, 2019).

Lestari *et.al.*, (2019) stated that the ecosystem topic is considered quite easy to understand but the deliver is quite boring. Learning media and teaching materials used are just limited to textbooks and worksheets. In general, Biology textbooks for high school are not yet interactive. To overcome these problems, researchers are interested in produce and develop an interactive e-book on ecosystem topic to train digital literacy for 10th grade senior high school students. This study aimed 1) to produce a valid interactive e-book on ecosystem topic to train digital literacy, and 2) to describe the practicality of interactive e-book on ecosystem topic to train digital literacy.

METHODS

This research was a development research used the ADDIE development model (analyze, design, development, implementation, and evaluation). This research was conducted from January - June 2022. Product development was carried out in the Department of Biology, Unesa. The product was tested on 20 students of SMA Negeri 1 Tarik.

The analysis phase aimed to find out all the needs in the development of research product. Aspects that need to be analyzed include curriculum analysis and student analysis. The product development design stage adjusts to the results of the curriculum analysis and the character of the students. Design the layout of the e-book was used Microsoft Word, then the document was saved in pdf format and imported into the Flip PDF Pro software. Flip PDF Pro serves to change the view into a model of flip book. The development stage was developed the product according to the design draft. Then the researcher consulted the product to the lecturer and revised it based on the suggestions given. The implementation stage was when the product was implemented in the learning process and tested on students. The evaluation stage was carried out at the end of each ADDIE stage.

Data collection techniques used in the form of questionnaires, exercises feature, and implementation sheets. Questionnaires were used to collect data on validity and practicality. Exercises feature was used to obtain practicality data. Data analysis used quantitative descriptive analysis.

The validity of the e-book was obtained from an assessment by three validators, namely two material expert and a Biology teacher. Assessment used a validation sheet. Validity includes aspects of presentation, content, and language feasibility. The validity data were analyzed using a Likert scale with a scale of 1-4 with the criteria in accordance with the following table:

Table 1. Validation Rubric Score

Criteria	Score
Very Good	4
Good	3
Good Enough	2
Not Good	1

Then the validation results were calculated use the formula below**:**

$$\text{Score (\%)} = \frac{Obtained\ score}{Maximum\ score} \text{ x } 100\%$$

The scores obtained interpreted according to the table of validity criteria below:

Table 2. Validity Interpretation Criteria

Validity Criteria	Score (%)
Very Valid	85-100
Valid	75-84
Valid Enough	60-74
Less Valid	40-59
Invalid	0-39

Adapted from Wulandari *et.al.*, (2020)

E-book was declared valid if got a score more than 74%.

The practicality of the e-book was reviewed based on the exercise scores on the Bio-Watch and Bio-Explore features, the implementation of the e-book, and student response questionnaires. Practicality based on exercise scores was compared with the Minimum Completeness Criteria (KKM) of SMA Negeri 1 Tarik (≥76). Practicality based on student responses and the implementation of the e-book were analyzed using the Guttman scale with the categories "Yes" and "No." "Yes" got 1 and "No" got 0. The results of both were calculated using the formula below:

$$\text{Score (\%)} = \frac{Obtained\ score}{Maximum\ score} \text{ x } 100\%$$

The score for the implementation of the e-book obtained will be interpreted based on the table of practicality criteria as follows:

Table 3. Practicality Interpretation Criteria in terms of The Implementation of The E-book

Practicality Criteria	Score (%)
Very well implemented and practical	85-100
Well implemented and practical	75-84
Practical Enough to Implement	60-74
Less Practical	40-59
Not Practical	0-39

Adapted from Wulandari *et.al.*, (2020)

E-book was declared practical in terms of the implementation of the e-book if got score more than 74%.

The student's response questionnaire scores then interpreted according to the table of practicality criteria below:

Table 4. Practical Interpretation Criteria in terms of Student Response Questionnaires

Practicality Criteria	Score (%)
Very Practice	86-100
Practice	71-85
Practice Enough	51-70
Less Practice	26-50
Not Practice	0-25

Adapted from Prihandono *et.al*, (2017)

E-book was declared practical in terms of the implementation of the e-book if get score more than 70%.

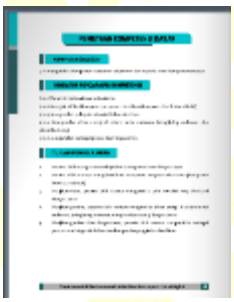
RESULT AND DISCUSSION

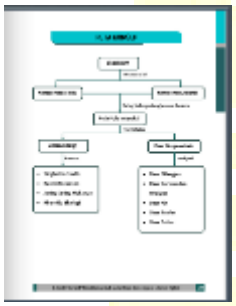
The results of this development research include the characteristics, validity and practicality of interactive e-book on ecosystem topic to train digital literacy for 10th grade senior high school students.

1. Characteristics of Interactive E-book

The e-book contains three sub-topics, namely ecosystem components, interaction patterns in ecosystem, and biogeochemical cycles. E-book is divided into three components, consist of introduction, content, and closing. The layout of the e-book was designed to attract readers' interest with images, videos, and hyperlinks that are directly integrated with search engines. Videos can be played in full screen mode which makes it easier for students to play and observe the content. In addition, videos can be accessed offline or via available hyperlinks. The following is the layout design of the e-book:

Table 5. E-book Layout Design

Layout View	Description
Introduction	
	The front cover of the Interactive E-book on Ecosystem Topic to Train Digital Literacy for 10th Grade Senior High School Students
	Foreword which contains an overview of the e-book material, target users, and the author's thanks to those who have assisted in the development of this e-book.
	Mapping of Basic Competencies contains Basic Competencies, Competency Achievement Indicators, and Learning Objectives.
	The Table of Contents contains a clickable list of all contents of the e-book, make it easier for students to go to the desired topic automatically.

Layout View	Description
	Instructions for The Usage of The E-book which contains instructions on how to use the e-book which includes buttons and their functions and things to pay attention when using the e-book.
	The E-book Features is a list of descriptions of the features contained in the e-book as well as digital literacy indicators that are trained on each feature.
	Concept Maps make it easier for students to find out the topics and the interrelationships between sub-topics in the Ecosystem topic.
Content	
	Apperception is an introductory part that relates real phenomena in daily life to Ecosystem topic.
	Ecosystem topic consists of 3 subtopics, including Ecosystem Components, Interaction Patterns in Ecosystems, and Biogeochemical Cycles equipped with various features.

Layout View	Description
Closing	
	About The Author contains the author's personal data and the supervisor.
	Back cover of the e-book.

The features of the e-book refer to indicators of digital literacy skills, including hyperlink navigation, internet searching, content evaluation, and knowledge assembly. This e-book contains five main features that train digital literacy including Bio-Figure, Bio-Article, Bio-Watch, Bio-Explore, and Eco Quiz as well as one supported feature, namely Bio-Reflection. The following is a description of all the features contained in the e-book:

Table 6. The Features of The E-book

The Features	Description	Trained Digital Literacy Indicators
	Contains about ecological figures.	Hypertextual navigation
	Contains articles that are equipped with hyperlinks to provide additional knowledge related to the material.	Hypertextual Navigation.

The Features	Description	Trained Digital Literacy Indicators
	Contains offline videos and equipped with hyperlinks to clarify information related to the material.	Hypertextual Navigation, Content Evaluation, dan Knowledge Assembly.
	Contains videos and website references to facilitate students to evaluate the content.	Hypertextual Navigation, Internet Searching, Content Evaluation, dan Knowledge Assembly.
	Contains 5 essay questions in a Google Form that can be accessed online.	Hypertextual Navigation, Internet Searching, Content Evaluation, dan Knowledge Assembly.
	Facilitate students to reflect on their understanding after learning.	There are no trained digital literacy indicators, as a supporting feature.

2. The Validity of The E-book

The developed e-book was then validated to three validators consisting of two material expert and a Biology teacher. Validity test served to determine the theoretical feasibility of the developed media. The following is a recapitulation of the validation results for the three validators:

Table 7. Recapitulation of Validation Result

No.	Indicator	Score V1	Score V2	Score V3	AVG
Presentation Feasibility					
1.	The e-book quality graphics	3	4	4	3,67
2.	The suitability of the type and size of the font	3	4	4	3,67
3.	Page layout	4	4	4	4
Presentation Average		**3,78**			
Score (%)		**94,50**			
Criteria		**Very Valid**			
Content Feasibility					
4.	Cover	4	4	4	4
5.	Preface	3	4	4	4
6.	The E-book Usage Guide	4	4	4	4
7.	Content Acuration	3	4	4	3,67
8.	Picture	4	4	4	4
9.	Video	4	4	4	4
10.	Interactive Indicator	3	4	4	3,67
11.	Digital Literacy Indicator → Internet Searching and Hypertextual Navigation	4	4	4	4
12.	Digital Literacy Indicator → Content Evaluation	4	4	4	4
13.	Digital Literacy Indicator → Knowledge Assembly	4	4	4	4
14.	Interactive and Train Digital	4	4	4	4

No.	Indicator	Score V1	V2	V3	AVG
	Literacy Features				
15.	Bio-Figure Features	4	4	4	4
16.	Bio-Watch Features	4	4	4	4
17.	Bio-Article Features	4	4	4	4
18.	Bio-Explore Features	4	4	4	4
19.	Bio-Reflection Features	3	4	4	3,67
20.	Eco-Quiz Features	4	4	4	4
21.	Question on Bio-Watch, Bio-Explore, and Eco-Quiz Features	4	4	4	4
22.	Bibliography	4	4	4	4
Content Average		**3,94**			
Score (%)		**98,50**			
Criteria		**Very Valid**			
Language Feasibility					
23.	Language use	4	4	4	4
Language Average		**4**			
Score (%)		**100**			
Criteria		**Very Valid**			
Total Average		**3,90**			
Score (%)		**97,50**			
Criteria		**Very Valid**			

Description:
V1 : Prof. Dr. Fida Rachmadiarti, M. Kes.
V2 : Dra. Winarsih, M. Kes.
V3 : Islamiyah, S. Pd., M. Si.

Based on the table above, the average validation results gained 97.50% with a very valid category. This showed that the developed e-book was feasible based on aspects of presentation, content, and language. In line with the Litbang Kemdikbud (2017), the criteria for a good textbook based on the results of the study consist of three, namely content, language, and presentation feasibility. In the process of developing the e-book, the researcher referred to the Litbang Kemdikbud and followed the advice of the supervisor and validators.

The presentation component obtained 94.50% with very valid criteria. This showed that the presentation of the e-book which includes the size of the e-book, the suitability of the type and size of the letters, and the layout of the e-book was considered very valid by the three validators. The e-book size is A5, the type font used is Candara with a standard size of 12. The layout of the e-book was arranged in a simple but attractive way by gave frames to the two corners of the image and provided special columns for each feature. A good textbook layout is an important factor in the success of material absorption. The layout of the textbooks can affect students' understanding of the material contained. The right layout can focus the attention of the reader. In addition, a good textbook layout helps make it easier for students to identify relevant information (Kurniawan and Patria, 2019).

The content feasibility component got 98.50% with a very valid category. This indicated that the content of the e-book which includes quality images, videos, hyperlinks; material accuracy; interactive indicators; digital literacy indicators; and the various features contained were considered very valid. This is in line with the research of Putra and Fitrihidajati (2022) that the material packaged not only with text but also equipped with pictures and videos can strengthen students' interest in learning. In addition, the videos presented about material concepts and videos about real phenomena in daily life related to Ecosystem material. This can overcome the limitations of space and time for students to directly observe ecosystem phenomena such as symbiotic forms of living things, food chains, and biogeochemical cycles. In addition, the videos presented are videos about real phenomena in everyday life related to Ecosystem material. One example of the video presented is a symbiotic mutualism between anemones and clown fish. This can overcome the limitations of space and time for students to directly observe these ecological phenomena. Wahyuni and Rahayu (2021) argued that providing information related to real phenomena in everyday life will make students learn the material faster and easier. This is reinforced by the statement of Sezgin and Ulus (2017) which stated that the advantages of multimedia images, videos, and hyperlinks that are combined in delivering messages can be enjoyed and effective for students because a lot of information is obtained. The accuracy of the material presented in the e-book refers to the Basic

Competencies of the Revised 2013 Curriculum. This is contained in the Basic Competency Mapping section which contains KD 3.10 Analyzing ecosystem components and the interactions between these components. In accordance with Fatmawati's (2016) statement, the preparation of learning media needed to conduct a curriculum analysis so that the subject matter of the media is in accordance with the Basic Competencies and it can achieve learning objectives effectively.

The developed e-book is also interactive. This can be seen in the e-book page that can be flipped, videos that can be played in full screen mode, and equipped with hyperlinks that are integrated directly with search engines such as Google. Available hyperlinks are marked with the words Klik disini! to make it easier for students to click and go to the website. One of the hyperlinks provided is about an ecological figure such as Hippocrates, Aristotle, and Theopratus who are pioneer scientists who make observations in the field of ecology. Learning media that are interactive, interesting, and different from others can motivate students so that the quality of learning becomes better (Prasetya, 2017). Putra and Fitrihidajati (2021) stated that the hyperlinks in the features facilitated students not to only read the concept of the material but also additional information that supported the material. In line with Mardhiyana (2017) said that learning does not only focus on understanding the concept of the material but also supported by exploration activities to clarify the concepts.

The features presented beside being interactive also refer to digital literacy indicators by Gilster (1997) including hyperlink navigation, internet searching, knowledge assembly, and content evaluation. There are 5 main features that train digital literacy skills which can be seen in **Table 6.** Hypertextual navigation indicator was trained on the Bio-Article feature which presents articles about five organisms that are able to live in extreme environmental conditions. The internet searching indicator was trained on the Bio-Explore feature which asked students to search information using the keywords Lorentz National Park on Google. Content evaluation and knowledge assembly indicator were trained on the Bio-Watch, Bio-Explore, and Eco Quiz features. For example, students are asked to answer the question "How does the earthworm process turn waste into compost?" after watching the video “Earthworms Turn Garbage into Compost”. This supports the National Literacy Movement program, one of which is training in digital literacy skills. Students with a high level of digital literacy are not be easily believe of hoax, provocative and destructive information (Kemendikbud GLN Team, 2017). Digital literacy is very necessary in the world of education to train students in sorting out credible concepts (internet searching and hypertextual navigation), think critically and creatively in evaluating content (content evaluation), and construct knowledge based on pre-existing credible information (Ifadah and Prastiwi, 2022).

The language feasibility component got 100% with a very valid category. This showed that the use of language and sentence structure is in accordance with the PUEBI (General Guidelines for Indonesian Spelling) and does not cause multiple interpretations. Supported by the statement of Sihafudin and Trimulyono (2020) that the use of appropriate language will make it easier for students to understand concepts and avoid wrong interpretations of the actual concept.

Based on the results of the validation, it’s necessary to make improvements in based on the suggestions from the validators which are presented in **Table 8.** below:

Table 8. Results of Improvements based on Suggestions from Validators

Suggestions	Results
Changed the typo of Apresepsi to Apersepsi	 

Suggestions	Results
Changed Subtopic A. to Ecosystem Compounding Components and the paragraph above it became an introduction and added an Ecosystem text that was placed in the center.	 
Replaced photos of photosynthetic organisms with self-documenting images.	  Gambar 2. Organisme Fotosintetik, Pohon Kakao Sumber: Dokumentasi Pribadi
Changed the numbering a) to a.	 

Suggestions	Results
Clarified the abiotic components in question no. 2 in the Eco-Quiz feature	A. **Jelaskan peran** dari *Hermetia illucens* atau Black soldier Fly B. **Identifikasilah komponen abiotik** yang ada pada artikel tersebut C. **Jelaskan menggunakan bahasamu sendiri,** bagaimana **cara** serangga tersebut dalam memecahkan permasalahan sampah di atas!

3. The Practicality of The E-book

The practicality of the e-book was assessed based on the implementation of the e-book, exercise scores on the Bio-Watch and Bio-Explore features, and student response questionnaires. The implementation of the e-book was observed by 3 Observers which Observer 1 and 2 observed 7 students and Observer 3 observed 6 students. Students are divided into three groups according to the observer. Each observer observed the activities of students from behind and walked around each table while the students used the e-book. Students who carried out activities according to the table, the observer put a check mark in the Yes column. Below is the recapitulation results of the implementation of the e-book:

Table 9. Recapitulation Results of The Implementation of The E-book

No.	Activity	Score O1	O2	O3
1.	The students open the document or the link of the e-book	7	7	6
2.	The students read The Instructions of The E-book	6	6	5
3.	The students read The E-book Features List	6	7	6
4.	The students read The Concept Map	7	7	6
5.	The students read The Appreception	7	7	6
6.	The students read the sub-topics namely Ecosystem Components,	7	7	6

No.	Activity	Score O1	O2	O3
	Ecosystem Interaction Patterns, and Biogeochemical Cycles			
7.	The students read the information and click the hyperlinks on the Bio-Figure features	7	7	6
8.	The students play the videos and answer the questions on the Bio-Watch feature	7	7	6
9.	The students click the hyperlinks and read articles on the Bio-Article feature	7	7	6
10.	The students play the videos, visit links, and answer questions on the Bio-Explore feature	7	7	6
11.	The students read the information on the Bio-Reflection feature	6	6	5
12.	The students do the practice question in the form GoogleForm on the Eco-Quiz features	7	7	6
Average		**6,75**	**6,83**	**5,83**
Total Average (%)		**97,05**		
Criteria		**Very well implemented and practical**		

The practicality of the e-book in terms of the implementation of the e-book got 97.08% with the interpretation very well implemented and practical. This showed that students can use e-books easily from opened the link or e-book document, read and used the features. It was easy for students to use the existing features, it can be proofed by students can be able to did the questions on the Bio-Watch and Bio-Explore features and geot scores above the KKM that can be seen in Table 10. An example of a question on the Bio-Watch feature is "Explain one example of the form of competition that occurs in the Competition in the Ecosystem video". In line with Rivai (2018), one of the indicators of media that supports learning is the ease of operation of the media so that learning objectives can be achieved effectively.

The practicality of the e-book was also seen from the completeness of the exercise scores on the Bio-Watch and Bio-Explore features. The practice score was then compared with the Biology KKM (≥76). Students are declared complete if they got a score more than and equal to the KKM. The results of the exercise scores recapitulation can be seen in the following table:

Table 10. Completeness Recapitulation of Exercise Scores on the Bio-Watch and Bio-Explore Features

The Students	Exercise Score	Category
1st	80	Complete
2nd	84	Complete
3rd	90	Complete
4th	91	Complete
5th	86	Complete
6th	94	Complete
7th	91	Complete
8th	94	Complete
9th	90	Complete
10th	96	Complete
11th	91	Complete
12th	94	Complete
13th	86	Complete
14th	96	Complete
15th	82	Complete
16th	85	Complete
17th	94	Complete
18th	92	Complete
19th	94	Complete
20th	89	Complete
Completeness Total (%)		**100**
Criteria		**Very Practice**

The level of practicality of the e-book in terms of the completeness of the exercise score is 100% Complete with very practical interpretation criteria. This showed that all students can do the exercises on the Bio-Watch and Bio-Explore features and got scores above the KKM. This completeness indicated that students have understood the ecosystem material in accordance with the Basic Competencies. The ecosystem material was divides into 3 subtopics including ecosystem components, interaction patterns in ecosystem, and biogeochemical cycles. Presentation of the material was supported by the Bio-Watch feature which trained digital literacy indicators in the form of hypertextual navigation, content evaluation, and knowledge assembly and the Bio-Explore feature which trained digital literacy indicators in the form of hypertextual navigation, internet searching, content evaluation, and knowledge assembly.

One of the factors that make the level of digital literacy low is the learning is not contextual (Fuadi et.al., 2020). Based on this, the Bio-Watch feature presents videos related to contextual ecosystem phenomena such as commensalism symbiosis between remora fish and sharks. This video can also overcome the limitations of students who cannot observe the phenomenon directly.

So far, ecosystem materials are considered quite easy but the delivery of material in class is quite boring (Lestari *et.al.*, 2019). One way to overcome this is by provide interactive learning media. One of the interactive activities was seen when students played the video "The Mechanism of Adaptation of Mangroves to High Salinity" on the Bio-Watch feature. The question presented is "Explain the mechanism of adaptation of the Salt Gland Mangrove Trees to high salinity!". Students answered "Mangrove leaves have glands and stomata where excess salt ions are stored on the leaf surface in the form of secretions which causes crystallization on the leaf surface called salt glands. The absorbed salt is also excreted in the process of transpiration through the stomata or stored in dead leaf tissue and old skin. With that, mangroves can survive in conditions of high salinity" (Fatchuriah H., answer sheet, June 17 2022). Another example was students played Lorentz National Park videos and clicking on the webiste available on the Bio-Explore feature. Students were then asked to answer questions related to the Lorentz National Park ecosystem based on the information they have found. One example of the problem is "3. Identify the biotic and abiotic components that make up the Lorentz National Park ecosystem". Students answer "Abiotic components: water, air, sunlight. Biotic components: ancient ferns, mangroves, long-beaked hog, wallabies" (Daffina, answer sheet, June 17 2022)

By did the questions on the Bio-Watch and Bio-Explore features and got scores above the KKM, students have gained experience to practice digital literacy. Learners with more active and productive digital literacy will be able to understand, explore, elaborate, disseminate, and create information wisely. In addition, practicing digital literacy skills can foster a critical and creative mindset and argumentation (Kemendikbud GLN Team, 2017).

The practicality of the e-book was also reviewed from the student response questionnaire. The results of the student response questionnaire recapitulation can be seen in the following table:

Table 11. Recapitulation of Student Response Questionnaires

No.	Statement	Score (%)	Interpretation
Presentation Practicality			
1.	The *e-book*'s size is proportional (not too small not to big)	100	Very Practical
2.	The type and size of the font easy to read	94.74	Very Practical
3.	The *e-book* design attracts readers' interest (with pictures, videos, and hyperlinks; color pages, and can be flipped)	100	Very Practical
4.	The *e-book* is easy to use in online and offline learning	100	Very Practical
5.	The *e-book* is easily access	100	Very Practical

No.	Statement	Score (%)	Interpretation
	via mobile phones and laptops		
	Average	**98.95**	**Very Practical**
Content and Features Practicality			
6.	Concept map is easy to understand	100	Very Practical
7.	The material is arranged in order and easy to understand	100	Very Practical
8.	The image presented is clear (not blurry and high resolution)	100	Very Practical
9.	The Bio-Figure feature presents ecological figures that increase students' knowledge	100	Very Practical
10.	The Bio-Figure feature provides easy-to-click and accessible hyperlinks	100	Very Practical
11.	The Bio-Figure feature helps students to train digital literacy skills in the form of hypertextual navigation.	100	Very Practical
12.	The Bio-Article feature provides easy-to-click and accessible hyperlinks	100	Very Practical
13.	The Bio-Article feature helps students to train digital literacy skills in the form of hypertextual navigation.	100	Very Practical
14.	The Bio-Watch feature provides easy-to-play videos (clear audio, legible text, and full screen mode)	100	Very Practical
15.	The Bio-Watch feature helps students to train digital literacy skills in the form of hypertextual navigation, content evaluation, and knowledge assembly	100	Very Practical
16.	The Bio-Explore feature provides easy-to-play videos and acessible hyperlinks (clear audio, legible text, and full screen mode)	100	Very Practical
17.	The Bio-Explore feature helps students to train digital literacy skills in the form of hypertextual navigation, internet searching, content	100	Very Practical

No.	Statement	Score (%)	Interpretation
	evaluation, and knowledge assembly		
18..	The Eco-Quiz feature provides questions to measure students' understanding of ecosystem topics	100	Very Practical
19.	The Eco-Quiz feature provides an easily accessible GoogleForm hyperlink (can access by mobile phones, laptops at anytime)	100	Very Practical
20.	The Eco-Quiz feature helps students to tarin digital literacy skills in the form of hypertextual navigation, internet searching, content evaluation, dan knowledge assembly	100	Very Practical
21.	The Bio-Reflection feature encourages students to reflect on material that has not been understood	94.74	Very Practical
Average		**99.67**	**Very Practical**
Langauge Practicality			
22.	The arrangement of the sentences in the *e-book* are easy to understand	94.74	Very Practical
23.	The terms used in the *e-book* are easy to understand	89.47	Very Practical
24.	Instructions for using the *e-book* are easy to do and understand	94.74	Very Practical
Average		**92.98**	**Very Practical**
Total Average		**97.20**	**Very Practical**

The practicality of the e-book in terms of student responses to the questionnaire got 97.20% with very practical interpretation criteria. The practicality aspect of presentation got 98.95% with very practical category. The students considered that the e-book was attractive to readers, had an attractive design, and was easy to use either via mobile phone or laptop. During the trial, all students accessed and used e-book via cellphones because they were considered more flexible and practical than using laptops**.** This is in line with Ruddamayanti (2019) that e-books are a technological breakthrough in learning media for both teachers and students that can increase the interest of readers because they are easy to carry anywhere and can be accessed anytime. Khan et al., (2017) stated that the availability of access to learning media anytime and anywhere provides convenience and accessibility benefits to students. In addition, e-book material that is packaged systematically and attractively will increase students' interest in studying the material (Solikah and Susantini, 2022).

The practical aspect of the contents and features got 99.67% in the very practical category. This showed that the materials and features were very

practical in training indicators of digital literacy skills. Students got the opportunity directly to click the hyperlinks and play the videos. The example of clickable hyperlinks were the Eden Project article in the UK, which is a program to create an artificial biome in the form of a greenhouse dome and a video that can be played was the difference between a food chain and a food web. In addition, students also practiced to assembly the knowledge and evaluate the content that available in the Bio-Explore feature. Students were asked to explain the unique fauna Babi Duri Moncong Panjang (*Zaglossus bruijni*) which is a protected animal in Lorentz National Park based on the webiste reference provided.

The linguistic aspect got 92.98% with very practical interpretation criteria. This shows that the arrangement of sentences and terms used in the e-book were easy to understand and in accordance with the level of knowledge of students. In line with Marpaung *et.al*, (2014) the correct and clear sentence structure will be easily understood by the reader correctly. This was supported by student comment stated that "The e-book is easy to understand and use".

The advantages of the developed e-book include interactive and equipped with pictures, videos, articles, and hyperlinks that contain real phenomena in daily life. The e-book is also equipped with exercise questions in the form of a google form so as to minimize the use of paper. In addition, this e-book has flexibility and accessibility that makes it easy for users which can be used offline in *.exe* format or online via a link. It can be accessed via mobile phones and laptops at any time. It supports distance learning, hybrid, and face-to-face learning.

CLOSING

Conclusion

Based on the results, this research 1) produces an ecosystem interactive e-book to train digital literacy for 10th grade senior high students which was very valid with a score of 97.50%, and 2) the practicality of e-book based on the implementation got 97.08 % with very good and practical interpretations, based on exercise scores on the Bio-Watch and Bio-Explore features got 100% Complete with very practical category, and based on the questionnaire responses, students gave positive response of 97.20% with very practical criteria.

Suggestions

Suggestions for further research are need for implement the interactive e-book to train digital literacy with a learning model that is suitable with the characteristics of the ecosystem topic and and measure the parameters of the effectiveness of the e-book to train digital literacy.

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