THE DEVELOPMENT OF E-BOOK "KNOWING BRYOPHYTA DIVERSITY" TO TRAIN DIGITAL LITERACY

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Abstract

Digital literacy is an ability to understand and use information needed by students in 21st-century education. Digital literacy can be trained using an e-book. Mosses plant are complex materials and need to be explained using multimedia so that the received information is not the wrong concept. This research aimed to produce an e-book of "Knowing Bryophyta Diversity" to train digital literacy theoretically and empirically. This was development research referring to the Fenrich instructional model which the stages are analysis, planning, designing, development, implementation, and evaluation and revision were done at each stage. The theoretical feasibility is determined based on the validation carried out by two botanists, and one educational expert. The empirical feasibility is determined based on the readability test using a paragraph of 100 words with three repetitions and the teacher's response conducted by five high school biology teachers. The e-book is arranged based on three aspects, namely aspects of presentation, content, and language feasibility. The research instrument used validation sheets, readability sheets, and teacher's response questionnaires. This research parameter included validation, readability, and teacher's response that analyzed descriptively quantitatively. The results showed that the theoretical feasibility based on the validity reached 97,45% with a very valid category, while the empirical feasibility based on the readability that showed the e-book was suitable used for students of grade X that were at level 10, and the teacher responses reached 98,89% with a very feasible category. Thus, the e-book "Knowing Bryophyta Diversity" expressed feasible to train digital literacy.

Keywords : e-book, digital literacy, and knowing bryophyta diversity

INTRODUCTION

The education of the 21st century requires students to have several skills in technology, media, and information which is digital literacy (Partnership for 21st Century Learning, 2015; Lee et al., 2015). Digital literacy is an ability to understand and use information in multiple formats which coming from various sources while presented through computers (Giltser, 1997). Digital literacy is an ability to precisely using digital tools and facilities not only to understand but also to identify, manage, analyze, evaluate, and build digital information (Martin, 2006).

Someone is labeled as digitally literate when mastering several competencies included internet searching, hypertextual navigation, content evaluation, and knowledge assembly (Giltser, 1997). A person is not only required to be able to search and manage everything digital, but the ability to research and integrate digital information is needed to be categorized as digitally literate (Greene et al., 2014).

Besides, someone is called as digitally literate when utilizing digital technology effectively and efficiently (Mohammadyari & Singh, 2015).

The ability of digital literacy can be seen based on Indonesian internet users who use the internet for communication via message (24,7%), accessing social media (18,9%), find work-related information (11,5%), looking for data related to school or college (9,6%), and others (35,3%) (APJII, 2018). Furthermore, Ting (2015) showed that students are accustomed to digital technology and only know how to access, create, and share information. Based on this, students and other internet users utilize digital technology limited to the ability to access social networks and search for information.

Limited digital literacy skills for students potentially obtain hoax information (Juditha, 2018). The survey of national hoax information conducted by Mastel (2018) revealed the target of the research included students (2,90%) showed that online hoaxes information were found on websites (34,90%), chat

applications (62,80%), and social media (92,40%). The online information that is spread makes users difficulty to determine between true and hoax information. Hoax information will have a negative impact including causing conflicts between groups to defend their respective opinions (Gumilar et al., 2017). Based on this, the internet user must be skilled and have critical thinking with the information received and must have good digital literacy skills.

Training effort the ability of digital literacy is using various tools and digital media in order decisions can be made and goals achieved (Spante et al., 2018). One of the technology or digital tools can be used as alternative learning media is a digital book or e-book (Ruddamayanti, 2019). An e-book is a transformed text from words, images, and existing forms in the file format computer to digital form (Rao, 2003). An e-book is one of teaching material that works as resources and controlling the learning process as the main learning support material that can increase students' learning motivation, and also can give provide opportunities for the student to study independently (Prastowo, 2018).

Research conducted by Zahara et al. (2014) showed the influence of the application of e-book 'Dunia Tumbuhan' reached 54% on the increase in cognitive learning outcomes of grade X high school students. Besides, Putri & Ambarwati (2019) stated that learning using the e-book "Invertebrates" also showed an effect of 81% on improving cognitive learning outcomes and 71% on increasing the ability of digital literacy.

Based on the Basic Competencies 3.8 and 4.8 that become the 2013 revised curriculum bill. One of the biological materials that need to be packaged practically in an e-book is a mosses material. Mosses material has characteristics that need to be understood like body structure, life cycle, variety, and diversity, also talus characteristics that difficult to observe without any tools like hand lens and microscope. Likewise, the cyclical life is not possible to observe a series of processes that take place at the haploid and diploid stages. Based on it, mosses material needs to be packaged practically in an e-book, due to e-book contains an image of body structure which can be enlarged to the size of the image, videos that load the life cycle of the mosses, and link or hypertext which presents additional information about mosses. An e-book that contains multimedia content or hypermedia

as like pictures, video, animation, also hyperlink can convey information to readers and can help readers to understand information (Haris, 2011: Korat & Shamir, 2004). The information is also packaged in e-book features that include digital literacy competencies including internet searching, hypertextual navigation, content evaluation, and knowledge assembly.

Based on the problem, this research aimed to produce an e-book "Knowing Bryophyta Diversity" to train students' digital literacy that is theoretically feasible based on the results of the validation and empirically feasible based on the readability test and the teacher responses. The e-book "Knowing Bryophyta Diversity" is expected to provide benefits of education, especially teachers and students. For teachers, e-books can provide additional references related to Bryophyta diversity, provide alternatives to teachers in using teaching materials that are suitable for mosses material, and can practice digital literacy to students. The benefits for students are as additional learning resources to know Bryophyta diversity and to be trained in digital literacy by using features contained in e-books.

METHOD

This study was development research being to develop an e-book "Knowing Bryophyta Diversity" to train digital literacy. This development research referred to the Fenrich instructional model, consisting of six stages, those are analysis, planning, designing, development, implementation, and evaluation as well as revisions were done at each stage. This development phase was carried out at the Biology Department of Universitas Negeri Surabaya in November 2019 - April 2020. The parameters of the e-book assessment were seen in terms of theoretical and empirical feasibility.

The theoretical feasibility is determined based on the results of the validation conducted by two botanical lecturers and one education expert lecturer. The validation sheet includes three aspects of the feasibility assessment, namely the feasibility of presentation, the feasibility of content, and the feasibility of language. The e-book validation data analyzed by calculating the value of the score given by the validator. Data obtained from the validator is a score of criteria that has been determined based on the Likert scale 1-4, 1 (not good), 2 (good enough), 3

(good), and 4 (very good). Furthermore, the results of the score from the validation sheet are calculated by the percentage value with the formula the number of scores obtained divided by the maximum score then multiplied by 100%. The percentage obtained is interpreted based on Riduwan (2016) criteria, namely 0-20% (invalid), 21-40% (less valid), 41-60% (valid enough), 61-80% (valid), and 81- 100% (very valid). The e-book "Knowing Bryophyta Diversity" is expressed to be valid based on the results of expert validation reached ≥ 61%.

The empirical feasibility is determined based on the results of the readability test and the teacher responses to the e-book "Knowing Bryophyta Diversity". The readability test uses a Fry Graph readability test sheet in the form of three paragraph samples with 100 words at the beginning (page 3), middle (page 11), and the end (page 22). One hundred words from the three samples calculated by the average number of sentences and the average number of syllables multiplied by 0.6. The result of the Fry Graph readability test obtained from the meeting point between the average number of sentences and the average number of syllables multiplied by 0,6 at the point between 9-12 on the Fry Graph.

Teacher responses were obtained from a questionnaire completed by five biology teachers from various high schools. The assessment based on the Guttman scale with the criterion of the answer "Yes" is 1 and "No" is 0. Furthermore, the results of the questionnaire sheet calculated the percentage value by the formula of the number of scores "Yes" obtained divided by the maximum number of scores and then multiplied by 100%. The percentage results obtained are interpreted based on Riduwan (2016) criteria, namely 0-20% (not feasible), 21-40% (less feasible), 41-60% (feasible enough), 61-80% (feasible), and 81 -100% (very feasible). The e-book "Knowing Bryophyta Diversity" is expressed to be empirically feasible based on the results of teacher responses reached 61%.

RESULTS AND DISCUSSION

This research produces the theoretical and empirical feasibility of an e-book "Knowing Bryophyta Diversity" to train digital literacy.

1. The Profile of E-book "Knowing Bryophyta Diversity"

The e-book "Knowing Bryophyta Diversity" is an electronic teaching material on mosses material that developed to fulfill basic competencies 3.8 and 4.8 bills and train students' digital literacy. The e-book contains a description of mosses material that divided into three chapters namely chapter 1 Bryophyta's characteristics and diversity, chapter 2 Bryophyta's life cycle, and chapter 3 of Bryophyta's role. The profile of the e-book can be seen in **Figure 1**.

Figure 1. The profile of e-book "Knowing Bryophyta Diversity"

The e-book "Knowing Bryophyta Diversity" was developed in electronic form, can be flip, and B5 in size. The e-book is equipped with images, videos, hyperlinks, activities, and quizzes that are presented through features to support the concept of mosses in learning. In addition, the feature is also a facility used to train digital literacy. The features in the e-book are presented in **Tabel 1.**

Tabel 1. The features of the e-book "Knowing Bryophyta Diversity" to train digital literacy

No.	Features	Digital Literacy Components	Description
1.	Mari kita lihat!	- Internet searching - Hypertextual navigation - Knowledge assembly	This feature requires students to examine the video and video sources and explain descriptions related to the video content.
2.	Situs Informasi	- Internet searching - Hypertextual navigation - Knowledge assembly	This feature requires students to invesitage additional information links that direct to the web and describe information related to the link contents.
3.	Mini Lab	- Internet searching - Hypertextual navigation	This feature requires students to do on observation activities or practicum activities virtually
4.	Pojok Literasi	- Internet searching - Hypertextual navigation - Knowledge assembly	This feature requires students to investigate information then describe responses related to information received.
5.	Kuis	- Hypertextual navigation	This feature requires students to do on the question of mosses material that is integrated with the internet

2. The theoretical feasibility of e-book "Knowing Bryophyta Diversity"

The e-book "Knowing Bryophyta Diversity" was assessed by three validators. The validator assesses three aspects in the validation sheet including the feasibility of presentation, the feasibility of content, and the feasibility of language (BSNP, 2014). The results of the e-book validity of each aspect presented in **Tabel 2**.

Tabel 2. The validity of e-book "Knowing Bryophyta Diversity"

No	Criteria Assesment	Score			(%)
		V1	V2	V3	
FEASIBILITY OF PRESENTATION					
1	E-book graphics quality	4	4	4	100
2	The suitability of the type of letter and size used in the e-book	4	3	4	91,67
3	E-book page layout	4	4	4	100
Average score			97,22%		
Category			Very valid		
FEASIBILITY OF CONTENT					
4	Cover	4	3	4	91,67
5	Preface	4	4	4	100
6	The instructions for using e-books	4	4	4	100
7	Mosses concepts	4	3	3	83,33
8	Picture	4	3	3	83,33
9	Video	4	4	4	100
10	Features that support digital literacy competence	4	4	4	100
11	Digital literacy features to internet searcing and hypertextual navigation competence	4	4	4	100
12	Digital literacy features to content evaluation competence	4	4	4	100
13	Digital literacy features to knowledge assembly competence	4	3	4	91,67
14	Bibliography	4	3	4	91,67
15	Glossaries	4	4	4	100
Average score			95,14%		
Category			Very valid		
FEASIBILITY OF LANGUAGE					
16	The language used	4	4	4	100
Average score			100%		

Information : V1 (education expert lecturer), V2 dan V3 (botany expert lecturers).

Based on **Tabel 2**, the e-book "Knowing Bryophyta Diversity" to train digital literacy that developed had a percentage of presentation feasibility reached 97.22%, content feasibility reached 95.14%, and language feasibility reached 100%. The overall percentages of the e-book validation got an average value reached 97.45% with a very valid category.

3. The empirical feasibility of e-book "Knowing Bryophyta Diversity"

The implementation phase of the e-book "Knowing Bryophyta Diversity" is carried out to obtain an empirical feasibility assessment. The results of the empirical feasibility assessment were obtained from the results of the e-book readability test and the teacher's response to the e-book.
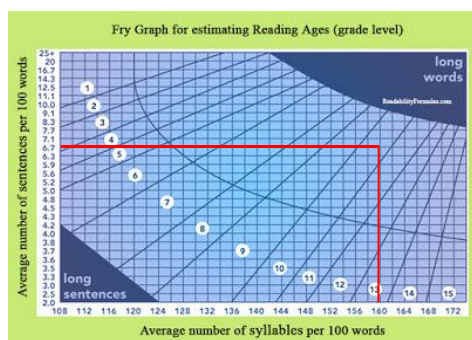
a. The empirical feasibility based on the e-book readability test

The readability test of the e-book "Knowing Bryophyta Diversity" was measured using the Fry Graph. This study used three samples taken randomly at the beginning, middle, and end paragraphs. The results of the e-book readability test are presented in **Tabel 3**.

Tabel 3. The results of the readability test of e-book with Fry Graph

Page	Sample	The Number of Sentences	The Number of Syllables x 0,6	Level
3	Beginning	5	157,2	11
11	Middle	9	162	10
22	End	6	160,8	10
	Average	6,7	160	10

Based on **Tabel 3**, the e-book "Knowing Bryophyta Diversity" has a level of readability at level 10. Level 10 obtained from the meeting point on the Fry Graph between the average number of sentences with the average number of syllables multiplied by 0,6 in one hundred words. Based on the three samples, we can find out the readability results in the following Fry Graph (**Figure 2**).

Figure 2. The results of readability test of e-book with Fry Graph

b. The empirical feasibility based on teacher's response to the e-book

The e-book "Knowing Bryophyta Diversity" was responded by five high school Biology teachers. Respondents responded to e-books through a questionnaire sheet, the results of which are presented in **Tabel 4**.

Tabel 4. The results of the teacher's response to the e-book

No.	Criteria Assesment	Persentation (%)	
		Yes	No
PRESENTATION CRITERIA			
1.	The size of the e-book is not too big and not too small	100	0
2.	E-book can be flip	100	0
3.	Font type and font size make it too easy for readers	100	0
4.	Font types and font sizes are presented consistently	80	20

No.	Criteria Assesment	Persentation (%)	
		Yes	No
12.	The video of mosses presented clarifies the concept	100	0
13.	Symbols and hypertext that contain links related to mosses be able to help students explore information and navigate the hypertext	100	0
14.	Symbols and hypertext that contain links related to mosses be able to help students evaluate content information	100	0
15.	Symbols and hypertext that contain links related to mosses be able to help students in collecting and evaluating information, as well as compiling new responses (knowledge assembly)	100	0
Average score		**100**	**0**
Category		**Very feasible**	
READABILITY CRITERIA			
16.	The e-book language is formal and standard.	100	0
17.	The e-book language is easy to understand	100	0
18.	The use of words/phrases in foreign languages is written in italics.	100	0

Based on **Tabel 4**, the e-book "Knowing Bryophyta Diversity" to train digital literacy responded by five high school biology teachers gets a percentage reached 98.89% with a very feasible category. This shows that the e-book "Knowing Bryophyta Diversity" can be used as additional teaching material for students.

The e-book "Knowing Bryophyta Diversity" which was developed is used to train the digital literacy of students. E-books are textbooks that are specifically designed using electronic devices and can be accessed through computers or other gadgets (Tosun, 2014). The e-book "Knowing Bryophyta Diversity" contains a series of mosses material concepts and has components such as images, videos, and hyperlinks in them. The advantages of multimedia images, videos, and hyperlinks that combine in conveying messages can be enjoyed and effective for students because a lot of information is obtained (Sezgin & Ulus., 2017).

Besides, the e-book "Knowing Bryophyta Diversity" has features that can train students' digital literacy. These features refer to competencies formulated by Giltser (1997) including internet searching competencies, hypertextual navigation, content evaluation, and knowledge assembly. This is following Ambarwati et al. (2019) and Putri & Ambarwati (2019) who stated that digital literacy can be improved and trained by achieving internet searching competency, hypertextual navigation, content evaluation, and knowledge assembly.

Based on the results that have been obtained, the e-book "Knowing Bryophyta Diversity" is assessed to be very valid with a percentage of 97.45% in terms of the validity with presentation, content, and language feasibility aspects. The score of the presentation feasibility reached 97.22% with a very valid category. The results of the presentation feasibility are also supported by the results of the teacher's response which states that the presentation feasibility of the e-book is considered to be very feasible and following the criteria for a good presentation. This is because the e-book developed has fulfilled three assessment components, namely e-book graphics quality, the suitability of the type of letter and size used in the e-book, and e-book page layout. The quality component of e-book graphics is seen from the size of the e-book and the type of e-book. The e-book "Knowing Bryophyta Diversity" has a size of B5 with the display that can be flip so that the e-book is simple and attractive. In line with the opinion of Fitriyani et al. (2017) states that e-books that can be flip like a real book, so that it gives its attractive impression and directs the attention of students.

The suitability component of the type of letter and size in the e-book can be seen from the combination of the types of font and the consistent size, namely times new roman 12pt and 14pt. The choice of type and size of letters is done to write many models of font types so that it is easy to read and does not interfere with the concentration of students (Ramadhani & Mahardika, 2015). The e-book page layout component is assessed from the multimedia layout contained in the e-book. The layout and appearance of text, images, videos, and hyperlinks in each chapter, arranged systematically and proportionally so that it can attract interest in use. According to Wang & Huang (2015), e-book development must pay attention to several components including design, use of font size and type, e-book introduction steps, and e-book suitability in the learning process. Besides, Muslich (2010) states that indicators of book presentation techniques must have an attractive, systematic, coherent appearance, and there is a balance between chapters.

The aspect of content feasibility gets an average value of 95.14% with a very valid interpretation based on the results of the validation. This is because the e-book "Knowing Bryophyta Diversity" has fulfilled the assessment of the feasibility of the content including e-book covers, preface, instructions for using e-books, mosses concepts, photos, videos, features that support digital literacy competence, bibliography, and glossaries. According to Muslich (2010), the validity of content feasibility must fulfill several things

including the suitability of the material with basic competencies, the accuracy of the material, and learning support material.

The material in textbooks or e-books is the most important thing in understanding students' concepts, so it must be relevant, systematically arranged, and can train various activities (Prastowo, 2015). Therefore, the e-book "Knowing Bryophyta Diversity" contains a description of the concept that was arranged systematically and adapted to basic competencies 3.8 and 4.8 namely the characteristics and diversity of Bryophyta, Bryophyta life cycle, and the role of Bryophyta. Besides the concept, photos and videos were also assessed to facilitate understanding in studying the material of the mosses, start from pictures of mosses habitat, characteristics of mosses, diversity of mosses, mosses anatomical structure, until a video of characteristics and life cycle of the mosses. This is supported by Surasmi (2016) which states that the use of photos and videos as additional media can help clarify and understand concepts.

The e-book "Knowing Bryophyta Diversity" not only contains a description of concepts, photos, and videos but also various activities related to the concept of mosses and digital literacy skills that presented through features. Mosses concept activities contained in the e-book are description activities of observing the characteristics of mosses based on images, videos, and information links, mosses classification activities, and phylogenetic analysis activities. The activity is combined with digital literacy, which in the features of 'Mari Kita Lihat', 'Situs Informasi', and 'Mini Lab' there are activities to visit the web and send the results of activity via email. Besides, the main activity to practice digital literacy is in the features of 'Pojok Literasi'. 'Pojok Literasi' activities ask students to analyze background information and respond to news and information in e-books. This is following by Giltser (1997) which states that students need to be trained in how to use the web properly, how to assimilate information, evaluate, and then reintegrate it to be more careful with information received and have good digital literacy.

Some of the information contained in hyperlinks contains information about the characteristics of mosses, the role of mosses, and news of mosses. The information presented can facilitate students to visit the web page provided to add information related to the material presented (Susilawati, 2016). Besides, the features in the e-book can also invite students to further expand knowledge, so that not only understand the contents of the material but also know additional information that supports the material. This is in line with Mardhiyana (2017) statement that learning is not just about understanding concepts but can further explore so that what is learned becomes too clear.

Aspects of language feasibility get an average value of 100% with a very valid interpretation because the language used is following the level of development of students, using official language and written according to the correct EBI rules, and using italics for words in foreign languages. This is supported by (BSNP, 2014) which states that the language in the book is communicative, according to the level of thinking of students, according to the correct rules, and the use of the correct terms.

The recapitulation results of the teacher's response to the e-book also support the results of the validation of getting an average value of 98.89% with a very feasible interpretation. The teacher's response is one of the determinants of the empirical feasibility of the e-book "Knowing Bryophyta Diversity". The teacher states that e-books are very appropriate as teaching materials used in learning, given how easy e-book access is, the appearance of e-books is attractive, the description of concepts is appropriate and can train digital literacy, as well as the use of official and standard language. The involvement of teachers in responding to e-books needs to be done, given the teacher's important role in selecting and determining appropriate teaching materials to assist students in achieving competence (Kantun & Budiawati, 2015).

Besides, the results of the validity and teacher responses to the e-book "Knowing Bryophyta Diversity" which states it is feasible to train digital literacy, the results of the fry graph readability test also support the feasibility of the e-book. These results indicate that the e-book reading sample corresponds to students' level of thinking which is at levels 10 (Figure 2). The e-book readability test "Knowing Bryophyta Diversity" to train digital literacy was carried out on three random reading samples namely the beginning, middle, and end of the e-book. Readability is the level of difficulty and ease of reading texts to be understood by users, thus the level of readability should be adjusted to the ability of

users (Widyaningsih, 2015). The suitability of the level of readability with its users is an important aspect so students can understand the contents of the reading well (Kaldum, 2016). Based on the results of the readability test, it can be seen that there is continuity between the level of readability with the target of e-book users, that is class X high school students, so it can be said that the e-book developed is empirically feasible in terms of its readability.

CONCLUSION

Based on the results and discussion, it can be concluded that the e-book "Knowing Bryophyta Diversity" to train digital literacy is represented theoretically feasible reached 97,45% with a very valid category from the results of validation based on the feasibility of presentation, content, and language. The e-book "Knowing Bryophyta Diversity" was also represented empirically feasible from the results of the readability test which showed that the e-book was suitable for high school class X students that were at level 10 and the results of the teacher's response reached 98,89% with a very feasible category.

SUGGESTION

Further research on the development of e-book "Knowing Bryophyta Diversity" to train digital literacy is implementing to the students to find out the responses and applying e-book to find out the activities of students in working on the features in an e-book.

ACKNOWLEDGMENT

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