

DEVELOPMENT OF INTERACTIVE E-BOOK ON BIOPROCESS TOPIC TO TRAIN DIGITAL LITERACY OF SENIOR HIGH SCHOOL GRADE XI

Pengembangan E-Book Interaktif Materi Bioproses Untuk Melatihkan Literasi Digital Kelas XI SMA

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Abstract

Information and technology are developing rapidly in the 21st-century, so they need to be balanced with digital literacy skills for students. Limited digital learning media during the Covid-19 emergency learning period impacted a lack of learning experience due to the lack of media that could support learning during the Covid-19 emergency, causing students to have difficulty understanding the topic. Bioprocess topic are considered complex topic. Therefore, it is essential to develop media that can train digital literacy on bioprocess topic. This study aimed to develop a valid, practical, and effective interactive e-book on bioprocess topic to train digital literacy of senior high school grade XI. This study uses a 4D development model, including the Define, Design, Develop and Disseminate stage. Collecting data through validation methods, Fry's legibility, test questions, and questionnaire responses to 20 students of grade XI MIPA SMA Negeri 8 Surabaya and biology teacher. The data collected were analyzed through descriptive-quantitative techniques. The results of the study indicate that the e-book is very valid, with a validity score of 3.73, so that it is suitable for use in learning; the e-book is declared practical based on the results of the readability test, which shows level 11, which is ideal to use by grade XI; The e-book was declared to be very effective based on the completeness of the digital literacy indicator with a percentage of 90.8% indicating a complete category and the responses of students and teachers who showed very positive responses with a percentage of 90.1% and 100%. Therefore, the interactive e-book on bioprocess topic able to train digital literacy of senior high school grade XI.

Keywords: e-book, interactive, bioprocess, digital literacy.

Abstrak

Informasi dan teknologi berkembang pesat pada abad 21, sehingga perlu diimbangi dengan keterampilan literasi digital pada peserta didik. Media pembelajaran digital yang terbatas ketika masa pembelajaran darurat Covid-19, berdampak pada pengalaman belajar yang kurang karena kurangnya media pembelajaran yang dapat mendukung pembelajaran pada masa darurat Covid-19 sehingga menyebabkan peserta didik kesulitan dalam memahami materi. Materi Bioproses dianggap sebagai materi yang sulit. Oleh sebab itu, sangat penting untuk mengembangkan media yang dapat melatih literasi digital pada materi bioproses. Tujuan penelitian ini adalah mengembangkan e-book interaktif yang valid, praktis dan efektif pada materi bioproses untuk melatih literasi digital pada kelas XI SMA. Penelitian ini menggunakan model pengembangan 4D meliputi tahapan Define, Design, Develop dan Disseminate. Pengumpulan data melalui metode validasi, keterbacaan Fry, soal tes dan angket respon pada 20 peserta didik kelas XI MIPA SMA Negeri 8 Surabaya dan guru biologi. Data yang dikumpulkan dianalisis melalui teknik deskriptif-kuantitatif. Hasil penelitian menunjukkan bahwa e-book sangat valid dengan perolehan skor validitas 3.73 sehingga layak digunakan dalam pembelajaran; e-book dinyatakan praktis berdasarkan hasil uji keterbacaan yang menunjukkan level 11 yang layak digunakan kelas XI; e-book dinyatakan sangat efektif berdasarkan ketuntasan indikator literasi digital dengan persentase 90.8% menunjukkan kategori sangat tuntas dan respon peserta didik dan guru yang menunjukkan respon sangat positif dengan persentase 90.1% dan 100%. Dengan demikian e-book interaktif materi bioproses yang dihasilkan dapat digunakan untuk melatih literasi digital pada kelas XI SMA.

Kata Kunci: e-book, interaktif, bioproses, literasi digital.

INTRODUCTION

Indonesia's national education system, as regulated in the Constitution of the Republic of Indonesia Number 20 of 2003 chapter 3, explains that the purpose of education is to create an effective learning process and atmosphere so that students can develop the potential for intelligence and skills actively for themselves, community, nation, and country. The new paradigm of 21st-century education aims to develop competencies using technology tools that are integrated as a whole, thus requiring learning strategies to be applied effectively (González-pérez & Ramírez-montoya, 2022). 21st-century education exists in an environment full of technology and characterized by ubiquitous access to information and information technology resources (Turiman et al., 2012). In order to realize effective learning in the 21st-century, students must be able to demonstrate various critical thinking skills related to digital literacy (International Reading Association, 2009; The Partnership for 21st Century Skills, 2009).

Digital literacy is the ability to access, manage, understand, integrate, communicate, evaluate, and create appropriate new information or knowledge through digital technology (Law et al., 2018). Another definition is stated by Gilster (1997) in (Huvila, 2012), which explains that digital literacy is the ability to understand and use information in multiple formats from a wide range of sources presented via computers. Digital literacy indicators adopted from the Digital Literacy book (Gilster, 1997) include indicators for Internet searching, hypertextual navigation, content evaluation, and knowledge assembly. Digital literacy indicators show the ability to access information and criticize and use various information on the internet appropriately and accurately (Rini et al., 2020).

Based on the results of the APJII survey in 2020 shows an increase in internet users in Indonesia by 25.5 million users from 2019, which is around 196.7 million users (Ahmad M. Ramli, 2020). The high number of internet users in Indonesia is not in line with the 2018 PISA (Program for International Student Assessment) results. Indonesia received an average score of 371, putting Indonesia in the second-lowest rank after Botswana (OECD, 2019)). These results make sense because the results of a survey conducted by the ISC (Indonesia Survey Center) show that the field of educational information services is not included in the five main reasons for using the internet (Irawan et al., 2020).

The Coronavirus Disease (Covid-19) pandemic that hit various countries impacts multiple fields, including the education sector in Indonesia. This situation requires the education component to carry out the online learning process, thus encouraging teachers to develop innovations and adaptations by utilizing available information technology and media in the learning process to support online learning (Ahmed et al., 2020). The Minister of Education and Culture (2020) urges that the implementation of learning during the Covid-19 Emergency is only carried out online to prevent the spread of Covid-19, as outlined in the Circular Letter of the Minister of Education and Culture Number 4 of 2020. The use of technology and information media in learning will implement learning more flexible.

Based on the results of the student responses questionnaire in grade XI MIPA SMA Negeri 8 Surabaya, it was found that about 89% of students used the internet to search for information data related to biology learning topics, but 54% of them had difficulty in finding correct, precise and accurate sources of information related. The internet to be used as additional learning resources. These results support the statement by Malaquias & Albertin (2021), which states that the increasing interest in information technology resources is one of the impacts of the Covid-19 social restrictions. The sophistication of ICT should make it possible to support learning plans during the Covid-19 pandemic, namely by using ICT-based learning media. However, the high percentage of internet users in grade XI of SMAN 8 Surabaya is proportional to the difficulty in evaluating the accuracy of the digital information they get on the internet and becomes a challenge for teachers to be able to train digital literacy students. In line with the International Reading Association (2009), which states that teachers can take full advantage of opportunities in learning development to explore new learning strategies and resources effectively with the use of ICT in the classroom.

The fact is that in online learning, students have difficulty understanding biology lessons. The subject studies related to living things, the environment, and the interactions in it, besides it is also related to the concept of natural and abstract living phenomena (Sudarisman, 2015). Therefore, students have difficulty understanding abstract and complex concepts in biology lessons. One of them is in the bioprocess topic of the membrane transport sub-topic contained in the basic competencies of grade XI 3.2, which analyzes various bioprocesses in cells, including the membrane transport mechanism in cells. Competence 4.2 is about making models of bioprocesses

that occur in cells based on literature studies and experiments. Based on the results of the student responses questionnaire, about 63% of grade XI students at SMAN 8 Surabaya have difficulty understanding the bioprocess learning topic due to the lack of interactive learning media to support online learning during the Covid-19 pandemic, so that need innovation in biology learning media to help the learning process during the Covid-19 emergency.

Based on previous development research, Hidayati et al., (2019) stated that e-book are effectively used to train digital literacy on climate change topic. In addition, research by Rachim & Ambarwati (2021) shows that e-book media also has high effectiveness in developing students' digital literacy through environmental change topic.

One of the ICT-based learning media that can be integrated with the Covid-19 pandemic learning design is an e-book. Some of the advantages of e-book are considered to overcome some of the limitations of printed books (Hatipoglu & Tosun, 2012). Compared to printed books, e-book can be stored longer because they include digital media and can access the information needed easily (Asrowi et al., 2019; Morris et al., 2017). In addition, e-book can be integrated with hypertextual navigation, and multi-media can support interactivity to support learning during the Covid-19 pandemic. In addition, the use of media in learning can increase understanding of biology lessons (Triana & Yuliani, 2018).

The interactive e-book that will be developed in this research contains digital literacy indicators that are integrated with features in the bioprocess topic e-book, including Bio-Think (Biology Thinking) feature integrated with hypertextual navigation indicators, content evaluation, and knowledge assembly, feature BiObs (Biology Observation) integrated with hypertextual navigation and knowledge assembly indicators, Bio-Cise (Biology Exercise) feature integrated with hypertextual navigation and knowledge assembly indicators, Find! feature that facilitated practice searching for digital information sources that interpret the topic and other supporting features.

Therefore, researchers are interested in developing an e-book learning media for bioprocess topic that contains activities to train digital literacy skills for students to understand biological topics from various sources of information and get learning experiences even during the Covid-19 pandemic. This development also supports access to equal opportunities for students to use ICT to improve learning and supports teachers initial steps in preparing students for their literacy future (International

Reading Association, 2009). This research aims to produce an interactive e-book of valid, practical, and effective bioprocess topic for training digital literacy of senior high school grade XI.

METHODS

This study uses a descriptive quantitative method with a 4D development model, including the stages of define, design, develop, and disseminate. Preparation of e-book using the help of Corel Draw and Flip Builder applications. Interactive e-book media on bioprocess topic that have been designed and then developed based on suggestions from supervisors and validators. The study was conducted on 20 students of grade XI MIPA 1 SMAN 8 Surabaya in February - March 2022.

The variables measured in this study were the validity, practicality, and effectiveness of the e-book. The level of validity of the e-book in terms of the results of the validation score obtained from the assessment of 3 validators consisting of 2 Biology Department lecturers, and a biology teacher on aspects of the feasibility of content, presentation, language, interactive assessment and digital literacy using a Likert scale with a score range 1- 4. The validity data obtained are in the form of a validation score which will then be interpreted as the validity of the interactive e-book with interpretation criteria, including 1.00 – 1.75 = less valid; 1.76 – 2.50 = Sufficiently valid; 2.51 – 3.25 = Valid and 3.26 – 4.00. Based on the validity criteria, the e-book is declared valid if it gets an average of 2.51.

Practicality in terms of readability of interactive e-book on bioprocesses topic analyzed through the Fry formula by determining the representative reading segments at the beginning, middle, and end of the e-book with 100 words, then calculating the number of syllables and sentences in the reading segment. Specify and multiply the number of syllables by 0.6. After that, the readability results are interpreted with the pseudo-point of the axis of the number of words and syllables. The location of the points on the graph can be interpreted according to the students' grade level. E-book is declared practical and can be used if the interpretation value is between points 10 – 12.

The effectiveness of student skills is carried out by knowing the completeness of each indicator of digital literacy skills, which consists of searching on the internet, hypertext direction guides, evaluating content, and compiling knowledge on the test questions given and comparing with the KKM applicable at SMAN8 Surabaya (≥ 75). The achievement of each digital literacy indicator

contained in the e-book features is calculated by the following calculation.

$$P(\%) = \frac{\sum \text{students complete the indicator } x}{\sum \text{sample}} \times 100\%$$

The percentage of completeness on each indicator is interpreted according to the criteria for interpretation of completeness indicators, an adaptation from Groundlund (1982), which is a scale of 0-24 = incomplete, 25-50 = less complete, 51-75 = complete and 76-100 = very complete. The digital literacy indicator in the interactive e-book of bioprocess topic is categorized as complete if the indicator completeness reaches more than 51%.

In addition, effectiveness is also seen by the responses of students and teachers, data obtained from student responses to interactive e-book on bioprocess topic using a questionnaire. The data analysis used the Guttman scale with a yes to 1 answer and a no to 0 answers. The data from the response questionnaire that students have filled out then calculated the percentage of student responses to interactive e-book on bioprocess topic using the following calculation formula.

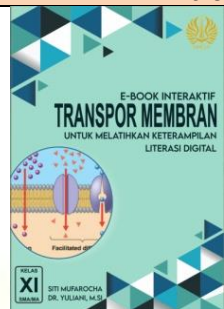
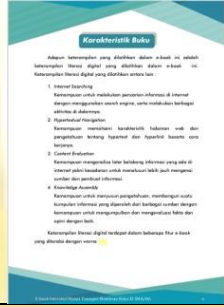
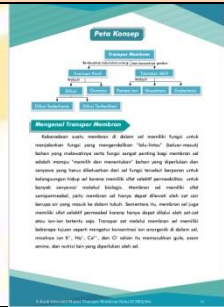
$$P(\%) = \frac{\sum \text{aspect answered "YES"}}{\sum \text{sample}} \times 100\%$$

The results percentage of responses are interpreted according to the response interpretation criteria adapted from Riduwan (2013), including 0 – 20 = not positive; 21 – 40= less positive; 41 – 60= quite positive; 61 – 80= positive; 81 – 100= very positive. The interactive e-book of bioprocess topic is categorized as effective in student responses if the percentage of student responses is more than 61%.

RESULT AND DISCUSSION

This research and development resulted an interactive e-book of bioprocess topic to train digital literacy for senior high school grade XI. The e-book contains bioprocess topic for membrane transport sub-topic. There are several components in the e-book, consisting of an introduction, contents, and closing section. The introduction includes the front cover, foreword, table of contents, instructions for using the book, characteristics of the book, basic competencies, and indicators as well as the expected goals after studying the e-book. The content section consists of a concept map of membrane transport topic and features contained in the e-book. The closing part of the e-book includes a summary, bibliography, and back cover. The following is an appearance of the interactive e-book that has been developed Table 1. below

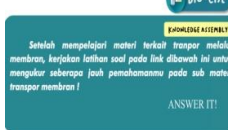
Table 1. Interactive E-Book Appearance

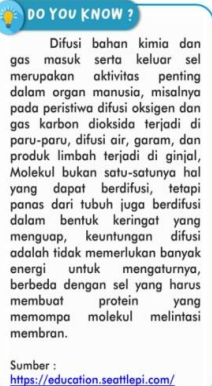
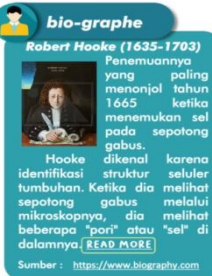
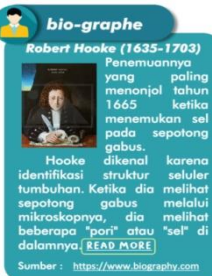
Appearance	Description
Introduction Section	
	Front cover part of interactive e-book bioprocesses topic on sub-topic membrane transport
	The user manual section of the e-book contains operating instructions for the e-book.
	The book characteristics page contains a description of the characteristics of the book, which includes a description of digital literacy indicators and the features contained in the e-book
Content Section	
	The topic concept map provides an overview of the topics studied in the e-book.
	The topic description section describes membrane transport topic and supports with various features.
Closing Section	

	The summary section is at the end of the chapter, which contains a summary of the topic studied in the e-book
	The back cover of the e-book bioprocess topic on sub-topic membrane transport contains a short explanation of the e-book.

This e-book is equipped with facilities that support students in practicing digital literacy skills, which are presented in the main features of the e-book, namely the Bio-Think, BiObs, Bio-Cise, and Find! features. These features provide activities that are integrated with digital literacy indicators. In addition, there are other supporting features, namely the Do You Know? and Bio-Graphe (Table 2.)

Table 2. E-book Features Description

No	Appearance	Description
1		Bio-Think A feature that presents description questions to check students' analytical skills that can train digital literacy indicators related to content evaluation and in the preparation of knowledge.
2		BiObs A feature that facilitates video observations related to membrane transport, and there are supporting questions.
3		Bio-Cise A feature used to check students understanding with knowledge assessment through a live worksheet.

4		Find! This feature used to train the search for digital information sources that interpret the topic.
5		Do You Know? This feature provides additional information to enrich biological knowledge
6		Bio-Graphe This feature presents biograph of essential scientists related to their discoveries that played a role in the development of biological sciences.
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An interactive e-book developed in the form of a flipbook with an HTML (Hypertext Markup Language) format that can be accessed via an internet website using a smartphone or laptop/pc. The developed interactive e-book contains images and integrates animated videos of learning topic. The learning videos presented can be accessed through hypertextual navigation and can be accessed without an internet connection. This e-book can be used for distance learning during the Covid-19 pandemic. In line with Majumdar et al (2020) and Malaquias & Albertin (2021) that the use of ICT-integrated media such as e-books can help to deal with Covid-19 restrictions, many elements of education using digital technology because they have the potential to support the learning process.

Three validators then validated the interactive e-book of bioprocess topic developed. The validation results are validity score with suggestions and input for improving the e-book before being tested on the samples. The following is a recapitulation of the score of the e-book validation results presented in Table 3. below

Table 3. Recapitulation of Validation Results Scores

No	Criteria	Score			Average
		V1	V2	V3	
Content Feasibility Aspect					
1.	Concept quality	4	4	3	3.67
2.	Quality Concept are Compatible with K13	3.67	4	3.33	3.78
3.	Updated	4	4	4	3.89
Content Feasibility Average		3.78			
Score interpretation		Very Valid			
Presentation Aspects					
4.	Presentation technique	3.67	3.33	3	3.33
5.	Topic Presentation Support	3	4	3.33	3.44
6.	Presentation Equipment	3.67	3.67	4	3.78
7.	Text Quality	3.67	4	3	3.56
8.	Image quality	4	3.67	3.33	3.67
9.	Video Quality	4	4	4	4
10.	Layout Quality	4	3.67	3.67	3.78
Presentation Average		3.65			
Score interpretation		Very Valid			
Linguistic Aspects					
11.	Quality of Indonesian Language Usage	3	4	4	3.67
12.	Use of Biological Terms	3.33	4	4	3.78
Linguistic Average		3.72			
Score interpretation		Very Valid			
Interactive Assessment Aspects					
13.	Interactive Quality on Bioprocess Topic E-book	3.67	4	3	3.56
14.	Features in the E-book include: a. Bio-Think b. BiObs c. Bio-Cise d. Find!	4	4	3	3.67
Interactive Average		3.61			
Score interpretation		Verv Valid			

Digital Literacy Aspects					
15.	Criteria for Digital Literacy Indicators in E-book include: a. Internet searching b. Hypertextual navigation c. Content evaluation d. Knowledge assembly	3.83	4	3.83	3.89
Digital Literacy Average		3.89			
Score interpretation		Very Valid			
Average of all aspects		3.73			
Score interpretation		Very Valid			

Based on the validation results of three validators, the developed e-book scored 3.73, with a very valid category. These results indicate that e-book is feasible to use in learning. The evaluation aspect of e-book validation has been adjusted to the Regulation of the Minister of Education and Culture Number 8 of 2016 concerning books used by academic units and developed by researchers following research interests (Kemendikbud, 2016). The validation score is obtained based on an assessment instrument that includes the feasibility of content, presentation, linguistic, interactive assessment, and digital literacy.

The feasibility contents of the e-book obtained an average score of 3.78, with a very valid category. These results indicate that the e-book has good quality, up-to-date topic concepts and is following the 2013 curriculum. The activities presented in the e-book can encourage students to do independent learning by obtaining information from various sources on the internet that are appropriate to foster a sense of belonging and curiosity. Ulumudin et al (2017) stated that one aspect of the topic that needs to be considered is that the topic presented can encourage the emergence of student independence.

The aspect of presentation the e-book with an average score of 3.65, the score indicates that the presentation of the e-book is very valid, seen from the presentation of the e-book which is systematically arranged, attractive design, neat layout and equipped with practice questions that make it easier for students to understand the topic. E-book use clear text fonts so that the information presented can be easily understood by students (Landoni & Gibb, 2000).

In the linguistic aspect, it obtained an average score of 3.72, which indicates a very valid category in terms of the use of following Indonesian PUEBI, communicative, detailed, and consistent use of biological terms. The study of Ulumudin et al (2017) revealed that language in books must be precise, detailed, clear, communicative, and informative so that it is easy to understand.

The interactive assessment aspect obtained an average score of 3.61, indicating a very valid category. This aspect is viewed from the interactivity of the e-book, which is easy to operate, has two-way interaction, and there is a combination of multimedia presented in the form of image media and learning videos. The two-way interaction relationship in the e-book is found in the practice questions raised in the Bio-Cise feature, which uses an interactive assessment model through a live worksheet. In addition, the main features presented reflect digital literacy indicators. There are four main features of the e-book, including the Bio-think feature, which trains hypertextual navigation indicators, content evaluation and knowledge assembly, BiObs teaches hypertextual navigation and knowledge assembly, Bio-Cise trains knowledge assembly and Find! to practice internet searching skills. E-book with features containing learning activities and strategies can help improve learning outcomes (Mohammed & Rahman, 2015).

The digital literacy aspect of the e-book obtained an average score of 3.89, which indicates a very valid category. This aspect is viewed from the activity in the e-book feature that can train digital literacy based on predetermined indicators. The e-book is designed to train students' digital literacy skills. The four indicators of students are integrated into the e-book feature. The e-book features train the ability to search for information on the internet through the Find! feature, train the ability to read news on the internet, know the function of hyperlinks and hypertext, and train in information assembly from the internet. Access to communication and information increases through digital technology such as internet platforms, social media, and mobile devices, so digital literacy skills are needed to live, learn, and work in society (Hidayati et al., 2019).

The practicality of the e-book was assessed based on the results of readability test using the Fry formulation. The readability test is used to analyze the text, which is designed so that the reader's level is at the appropriate level of difficulty so that can be predicted that the reader can read and understand the reading text well (Janan & Wray, 2014). The results of the readability test are presented in Table 4. below

Table 4. E-book Readability Test Results

Samples	Page	Σ sentences	Σ syllables	Level
Membrane transport	11	4.1	$254 \times 0.6 = 152.4$	11
Facilitated Diffusion	15	3.9	$253 \times 0.6 = 151.8$	11
Endocytosis	23	4.8	$271 \times 0.6 = 162.6$	12
Average		4.2	155.4	11

Based Table 4. shows the level of e-book readability at level 11 obtained from the meeting point in the Fry Graph. The graph of the average results of the three readability samples is presented in Figure 1 below

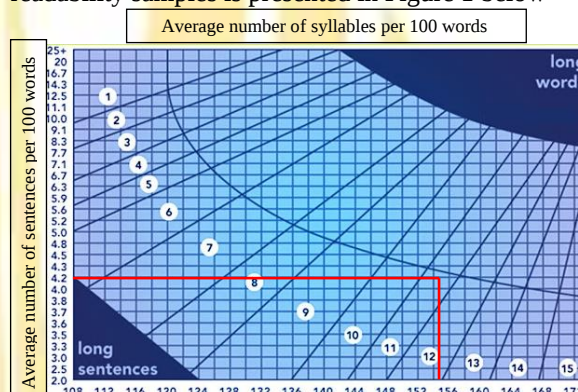


Figure 1. Fry chart result of e-book readability test

The readability test results in Figure 1. show the average results according to the thinking level of high school students, namely at level 11. However, the third reading sample shows a higher level because the sample contains complex sentences. Olagoke (2013) wrote that the complexity of a sentence could be indicated by the number of words per sentence and the number of words with five or more syllables. Senior high school grade XI have students with different reading experiences and levels so that some students may be above the reading level, and some students may be below the level that they should be (Gül, 2021). Therefore, levels 11-12 included students' reading levels in grade XI.

The effectivity of the e-book is reviewed based on the completeness of the digital literacy indicators presented in the main features of the e-book.

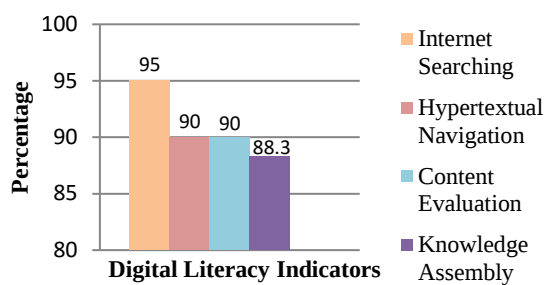


Figure 2. Digital Literacy Indicator Completeness Recapitulation

Based on the recapitulation completeness of the digital literacy indicators in Figure 2. obtained an overall average score of 90.8% with a very complete category, which shows that e-book are very effective in training digital literacy. Digital literacy skills are ability using digital technology, like accessing, managing, understanding, integrating, analyzing, evaluating information, and forming new knowledge (Law et al., 2018; Setyaningsih et al., 2019). The internet searching indicator obtained 95% percentage in very complete category. The result illustrating that students can carry out the process of searching for information on the internet using search engines properly. These indicators are trained in e-book through the Find! feature, where students carry out activities to search for digital information sources related to passive transport topic.

The hypertextual navigation indicator, it reaches a 90% percentage, which indicates a very complete category. Hypertextual navigation is the ability to navigate digital sources and the know-how to operate them (Rini et al., 2020). This ability can be trained by providing navigation tools in the e-book. The tools provided include the table of contents, facilities for answering, article references, and facilities for observing and flipping pages. Hypertextual navigation can easily navigate to a specified place in the text, such as opening a distant part of the topic text (Eshet-Alkalai, 2004).

Furthermore, the ability of content evaluation also achieved a percentage of 90%, which was included in the very complete category. This ability indicates that students can evaluate and criticize the accuracy of digital information by analyzing the background and exploring further the information maker (Shepherd & Henderson, 2019). These abilities are trained through Bio-Think feature that facilitate choosing accurate information on the internet to be used in the learning process. Students who can evaluate content show that they can identify the most helpful information to be used as one of the processes in digital literacy (Leaning, 2019).

The knowledge assembly indicator achieved 88.3% in the very complete category. Compared to the percentage of other indicators, this indicator gets the lowest rate because some students did not complete this indicator. Knowledge assembly capability is the ability to process knowledge and information obtained from various digital sources by compiling the acquired knowledge and producing new knowledge. Sharma et al (2021) consider a theory of the information processing model to explain that each individual can process different information due to differences in their cognitive capacities. Therefore, the knowledge assembly indicator requires cognitive strategies such as repeating the information to achieve better results.

After the learning process using an interactive e-book of bioprocess topic was carried out, the results of the four digital literacy indicators showed very complete category. These results indicate that e-book are effectively used in learning. The effectiveness of e-book is influenced by the completeness of e-book that can support students in the learning process. The e-book used is equipped with features and have various learning instructions that facilitate students practicing digital literacy. Digital-based media that provide special instructions can increase awareness about the potential of using ICT for their well-being (OECD, 2019).

Learning activities on the e-book feature that trains the four digital literacy indicators can encourage students to construct their knowledge. These activities support students in accessing, processing, and developing information and knowledge obtained through digital literacy indicators. The involvement of students in their learning activities using in learning encourages students to construct their knowledge, which steps in constructing are related to abilities in digital literacy. In line with Piaget's theory of constructivism (1953) in Powell & Kalina (2009) states that students construct their knowledge through assimilation and accommodation processes. This knowledge is formed from personal experienced by students through their learning activities using e-book.

Digital literacy skills help students obtain information related to learning topic from various information sources that are increasing rapidly. Digital literacy skills is an essential element for every individual because now we have entered the digital era where the increasing availability of information on the internet and digital technology is snowballing in various fields of life, including education. In line with Naik & Padmini (2014) research reveals that the current abundance of information technology needs to be balanced with critical abilities and

awareness regarding the importance of using information wisely. Therefore, digital literacy skills are essential to be trained students to equip and prepare themselves in the digital era.

The effectiveness of the e-book is also seen by the results of the responses of students and biology teachers at SMAN 8 Surabaya. The results of these responses were obtained through the distribution of response questionnaires to the interactive e-book of bioprocess topic presented in Table 5. below

Table 5. Recapitulation of Students and Teacher Responses

No	Statement	Score (%)		Interpretati on
		Stude nt	Teache r	
Content Presentation				
1.	E-book according to learning objectives	95	100	Very Positive
2.	Easy to understand the topic	100	100	Very Positive
3.	Add topic insight	100	100	Very Positive
4.	Able to construct knowledge independently	100	100	Very Positive
Average		98.75	100	Very Positive
Physical Presentation				
5.	Attractive e-book appearance	100	100	Very Positive
6.	Features help understand the topic	100	100	Very Positive
7.	Interesting reading and motivation to learn	95	100	Very Positive
8.	Instructions for use are easy to understand	100	100	Very Positive
9.	E-book are easy to use	100	100	Very Positive
10.	The text and pictures are visible	100	100	Very Positive
11.	Easy-to-read layout	95	100	Very Positive
12.	Attractive e-book design and color	100	100	Very Positive

Average		98.75	100	Very Positive
Language Usage				
13.	Language are easy to understand	100	100	Very Positive
Average		100	100	Very Positive
Characteristics of interactive e-book				
14.	There is a two-way interaction	95	100	Very Positive
15.	Interesting media combination	100	100	Very Positive
16.	E-book is easy to operate	100	100	Very Positive
17.	Features in the e-book integrate digital literacy indicators a. Bio-Think b. BiObs c. Bio-Cise d. Find!	100	100	Very Positive
Average		98.75	100	Very Positive
Digital Literacy Skills				
18.	E-book content trains digital literacy well	100	100	Very Positive
19.	Activities in e-book encourage digital literacy skills a. Internet searching b. Hypertextual navigation c. Content evaluation d. Knowledge assembly	98.75	100	Very Positive
Average		99.3	100	Very Positive
Average of all aspects		99.1	100	Very Positive

Based on the results responses in Table 5. shows a very positive response of students and teachers to the e-book that has been developed, with an average percentage of students and teachers of 99.1% and 100%, respectively. These results indicate that e-book is very effective to use. The responses of students and teachers were also reviewed from the answers given through the suggestions and commentar column in the response questionnaire sheet.

Students provide responses on the response questionnaire sheet, some students expressed their responses that the e-book have been developed are exciting and easy to understand because it is equipped with animated learning videos that can be accessed offline and practice questions to train students understand, in line with the research of Lim et al (2020) shows that the use of media with animation, images, and videos in learning is more effective than using text and static images.

CLOSING

Conclusion

Based on the results of the research, it can be concluded that the interactive e-book of bioprocess topic that has been developed is valid, practical, and effective to be used to train digital literacy for grade XI with a validity score of 3.73, readability is at level 11 which corresponds to grade XI, completeness of digital literacy indicator achieved 90.8% percentage with a very complete category and positive responses from students and teacher with a score of 99.1% and 100% percentage.

Suggestion

Researcher suggest that further research is needed regarding the development of media that can train other digital skills to support 21st-century learning and additional research related to the application of e-book in learning to determine student learning outcomes

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