An Effort in Teaching Invertebrates and Training Digital Literacy to the Students

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Abstract. Digital literacy is an ability to understand and use information in multiple formats and sources while presented through computers. The research purposes have analysed the influence of the electronic Invertebrate book on students’ digital literacy and learning outcomes, as well as describe student responses upon learning process using electronic Invertebrate book. This research used mixed-method. The research samples selected using purposive sampling. Student’s digital literacy and learning outcomes, in the form of pre-test and post-test, were analysed quantitively using normalised gain scores (g). The difference between pre-test and post-test in treatment or control class calculated using Wilcoxon test. Meanwhile, the post-test score and normalised gain score between treatment and control class calculated using Mann-Whitney test. The student’s responses through the learning process were analysed descriptive-quantitatively using questionnaire. The result revealed that about 57% of students completed the digital literacy test and 100% of them enhanced in the category of medium to high on digital literacy skills.

1. Introduction

Producing human resources who have 21st-century competencies is one of the education targets. 21st-century competencies consisted of cognitive skills and the skills of technology, media and information; learning and innovation skills, and also life and career skills [1]. Digital technology plays an important role in the development of education, especially the development of the 21st century [1]. Digital literacy is an ability to understand and use information in multiple formats which coming from various sources while presented through computers [2]. Martin [3] stated that digital literacy is the awareness, attitudes, and abilities of individuals to precisely using digital tools and facilities to identify, access, manage, integrate, evaluate, analyze and synthesize digital resources, build new knowledge, create media expressions, and communicate with others, in the context of specific life situations, to enable constructive social action. Thus, the definition of digital literacy is not only the process of students accessing information through digital media, but also the process of students to understand, process, analyse, evaluate, and build digitally available information.

Although currently students are generally considered technology-savvy, many of them find it challenging to do well. The students are labelled as digitally literate when mastering several competencies [4]. Digital literacy should be studied and taught [2]. The teacher needs to train students on how to use the Web correctly and how to be critical, how to assimilate information, evaluate, and then integrate it [2]. Students' digital literacy skills need to be improved because although students are now familiar with digital technology, students generally only know how to access, create and share digital information [5]. Poor understanding of digital literacy can affect the psychology of students who
tend to insult, lead to jealousy towards others, moodiness towards negative comments, depression, and get to communicate using politeness languages [6]. The abundance of information spread through the internet made it difficult for audiences to determine the correct information with fake ones. As a result, this wrong information was part of a conflict between groups to defend their opinions [7].

In the previous study [8] an electronic Invertebrate book was developed and stated to be very feasible and practical. Digital literacy has also been successfully trained through the development of digital literacy-based electronic books that integrated with digital technology and information. The material contained in electronic Invertebrates book is according to the latest revised 2013 Curriculum. The selection of material based on Basic Competencies 3.9 namely “Grouping animals into phyla based on body layers, body cavity, body symmetry, and reproduction”. The demands of Basic Competencies 3.9 stated that Invertebrate material has a broad scope of material and often makes it difficult for students to describe characteristics and classifies each phylum in a limited meeting, thus influencing students' understanding and interest in Invertebrate material [9]. Based on observations in ten high schools in Gresik showed that 100% of learning still rely on textbooks as the central learning resource and has never used several electronic book references or other learning resources. Based on Putri & Ambarwati’s research [10], the content of digital literacy in Biology Class X textbooks on Animalia was still low. Although internet usage has been encouraged in several schools, not all teachers can train students to browse the internet properly, and not all students can find the right and reliable information through the internet. Therefore, Gilster [2] formulated four student competencies which said to be digital literacy used in this study, including internet searching, hypertextual navigation, content evaluation, and knowledge assembly. Based on the problem, it is necessary to follow up the research of electronic Invertebrate book development [8] which have been done by applying the book to find out its role in increasing student digital literacy.

2. Method
This study was mixed-method research [11]. The research was located in the Biology Department, Universitas Negeri Surabaya and SMA Negeri 1 Gresik during January to April 2019. The data collected on February 4 to 18, 2019. The research sample selected using purposive sampling. The samples were class X MIPA 1 and X MIPA 2. Both of them are experiment and control classes which consisted of 30 students. In this study, the components used to measure digital literacy are according to Gilster [2], they are internet searching, hypertextual navigation, content evaluation, and knowledge assembly.

The procedure of this study consisted of preparation, implementation and analysis of data. The research instruments were digital literacy assessment sheets, learning outcome assessment sheets, and student response questionnaire sheets. Data collected from tests and questionnaires. The research results were analysed based on students’ mastery of digital literacy, student’ mastery of learning outcomes, and student responses. Students’ mastery of digital literacy assessed using pre-test and post-test scores of digital literacy aspect based on minimum standard adapted from [12], that was 71. The students were categorized into very poor (<30%), poor (30-50%), sufficient (51-70%), good (71-90%) and excellent (91-100%). Students’ mastery of learning outcomes assessed using pre-test and post-test scores of cognitive aspects based on the minimum standard from the school, that was 75. Then, the digital literacy and learning outcomes data calculated using normalised gain scores (g). The difference between pre-test and post-test in treatment or control class calculated using Wilcoxon test. Meanwhile, the post-test score and normalised gain score between treatment and control class calculated using Mann-Whitney test. The student response analysed using Guttman scale assessment criteria, then calculated the percentage and interpreted using student’s responses category levels.

3. Results and Discussion
The results showed that students' digital literacy in the treatment class was mastery in the percentage of 57% with 3% student categorised as excellent and 54% of students categorised as good. Students in the percentage of 43% were not mastery with sufficient categories. While in the control class, 100% of students did not mastery digital literacy with 3% of them categorised as sufficient, 7% as poor, and 90% as very poor. Based on the normalised gain score of the treatment class, there was no student who experienced an increase in the low category of digital literacy, 13 students experienced an increase in
the medium category and 17 students in the high category. In normalized gain score of the control class, all students did not experience an increase (Figure 1).

![Histogram of student's digital literacy improvement in the treatment and control class based on normalised gain scores (g)](image)

**Figure 1.** Histogram of student’s digital literacy improvement in the treatment and control class based on normalised gain scores (g)

The results of statistical tests showed that there was an influence of learning using the electronic Invertebrate book on students’ digital literacy, detailed in Table 1.

**Table 1.** Statistical test results of student’s digital literacy in treatment and control class

| No. | Parameters                                                                 | Explanation                                                                 |
|-----|---------------------------------------------------------------------------|---------------------------------------------------------------------------|
| 1.  | The difference between pre-test and post-test scores of digital literacy in treatment class. | Significantly different, based on the Wilcoxon test with the significance level of 95% |
| 2.  | The difference between pre-test and post-test scores of digital literacy in the control class. | Not different, based on the Wilcoxon test with the significance level of 95% |
| 3.  | The difference in digital literacy post-test score between treatment class and control class. | Significantly different, based on the Mann-Whitney test with the significance level of 95% |
| 4.  | The difference in digital literacy gain score (g) between treatment class and control class. | Significantly different, based on the Mann-Whitney test with the significance level of 95% |

Four indicators of digital literacy in the learning process using the electronic Invertebrate book, are Internet searching, hypertextual navigation, content evaluation, and knowledge assembly (Table 2).

**Table 2.** The percentage of digital literacy indicators mastery between treatment and control class

| No. | Indicators                                                                 | Treatment class (%) | Control class (%) |
|-----|---------------------------------------------------------------------------|---------------------|------------------|
| 1.  | 3.9.7 Formulate the stages of information searching related to Invertebrate material on the Internet using the search engine. | 75                  | 4.3              |
| 2.  | 3.9.8 Identify the navigation of hypertext in the web browser related to Invertebrate material. | 72.5               | 27.8             |
| 3.  | 3.9.9 Evaluate the validity of content related to Invertebrate material. | 79.5               | 22.9             |
| 4.  | 3.9.10 Manage information related to Invertebrate material in the form of fact and opinion that has been found online. | 56                 | 14.2             |

**Average (%)** 71 17

Based on Table 5, it is known that the average mastery of each indicator in the treatment class was 71%, and the control class was 17%. In the treatment class, the digital literacy indicator that experienced the highest mastery was the 3.9.9 indicator which was 79.5%, and the lowest was at the indicator 3.9.10 which was 56%. The digital literacy indicator in control class, the highest mastery was the 3.9.8 indicator which was 27.8%, and the lowest indicator was 3.9.7, which was 4.3%.
The result also showed that student learning outcomes in the treatment class were 80% mastery and 20%, not mastery. In the control class is 77% mastery, and 23% is not mastery. Based on the normalized gain score of the treatment class, there was no student who experienced an increase in low category learning outcomes, and six students experienced an increase in the medium category and 24 students in the high category. In normalised gain score results of the control class, there was no student who experienced an increase in low category learning outcomes, and seven students experienced an increase in the medium category, and 23 students experienced a high category increase (Figure 2).

![Figure 2. Histogram of student learning outcomes improvement in the treatment and control class based on normalised gain scores (g)](image)

The results of statistical tests showed that there was an influence of learning using the electronic Invertebrate book on student learning outcomes, detailed in Table 3.

| No. | Parameters | Explanation |
|-----|------------|-------------|
| 1.  | The difference between pre-test and post-test scores of learning outcomes in treatment class. | Significantly different, based on t-test with the significance level of 95% |
| 2.  | The difference between pre-test and post-test scores of learning outcomes in the control class. | Significantly different, based on the Wilcoxon test with the significance level of 95% |
| 3.  | The difference in learning outcomes post-test score between treatment class and control class. | Significantly different, based on the Mann-Whitney test with the significance level of 95% |
| 4.  | The difference in learning outcomes gains score (g) between treatment class and control class. | Not different, based on the Mann-Whitney test with the significance level of 95% |

They are six indicators of students’ outcomes in the learning process using electronic Invertebrate book. The average treatment indicator was 81%. Meanwhile, the control class was 78% (Table 4).

| No | Indicators | Percentage (%) |
|----|------------|----------------|
| 1. | 3.9.1 Analyze the basic classification of phylum levels in animals based on body layers, body cavity body symmetry, and reproduction | Treatment class: 92.2, Control class: 78.9 |
| 2. | 3.9.2 Explain the general characteristics of Porifera Phylum members. | Treatment class: 93.3, Control class: 82.2 |
| 3. | 3.9.3 Analyze the differences in several life cycles as a basic classification of class in the Coelenterata Phylum. | Treatment class: 54.2, Control class: 60.4 |
| 4. | 3.9.4 Describe the life cycle of Platyhelminthes Phylum’ members. | Treatment class: 79.4, Control class: 92.2 |
| 5. | 3.9.5 Analyze the distinguishing features of members of the Phylum Platyhelminthes, Nemathelminthes, and Annelida. | Treatment class: 85.6, Control class: 90 |
| 6. | 3.9.6 Grouping members of Phylum Arthropod to the class level. | Treatment class: 79, Control class: 63.1 |

**Average (%)** 81 78
Based on Table 4, the mastery average of each indicator in the treatment class was 81%, and the control class was 78%. In contrast to the control class, the learning outcome indicators that experienced the highest mastery was 3.9.4 indicator in the score of 92.2%, and the lowest was 3.9.3 indicator, in the score of 60.4%. A class was mastery if 75% of students reach a value of ≥ 75. The two classes were mastery because 80% of individual scores in the treatment class were mastery and 77% of the individual scores in the control class were mastery.

Student responses measured using student response questionnaires. Most students (97.4%) gave a positive response to learning using electronic book Invertebrates for enhancing digital literacy skills. Thus, it can be stated that students give a very good response to the learning using the electronic Invertebrate book to improve the digital literacy of high school students grade 10 (Table 5).

Table 5. Students responses to the learning using the electronic Invertebrate book

| No | Criteria                                                                 | Percentage (%) |
|----|--------------------------------------------------------------------------|----------------|
| 1. | Learning atmosphere of Invertebrate sub material was entertaining.        | 96.7           |
| 2. | Learning atmosphere of Invertebrate sub material was fun.                | 93.3           |
| 3. | Learning of Invertebrate sub material made students easier to know the characteristics of each phylum of Invertebrate animals. | 100            |
| 4. | Learning of Invertebrate sub material made students easier to classify Invertebrate animals. | 100            |
| 5. | Learning of Invertebrate sub material made students easier to identify the phylum of Invertebrate animals. | 100            |
| 6. | Usage instructions made students easier to operate electronic book Invertebrate. | 100            |
| 7. | Learning goals and chapter descriptions helped students to use electronic book Invertebrate. | 96.7           |
| 8. | Learning atmosphere about Invertebrate using electronic book Invertebrate was a new thing for students. | 93.3           |
| 9. | Learning atmosphere of Invertebrate sub material using electronic book Invertebrate was fun. | 96.7           |
| 10.| Electronic book Invertebrate facilitated students to study independently outside school hours. | 96.7           |
| 11.| Electronic book Invertebrate support learning and additional information about Invertebrate. | 100            |
| 12.| Electronic book Invertebrate helped students to observe parts of Invertebrate animals that were invisible and rarely found. | 100            |
| 13.| Features in electronic book Invertebrate support the learning process of students about Invertebrate material. | 100            |
| 14.| Invertebrate material contents in electronic book Invertebrates was appropriate if paired with face-to-face learning in the form of practicum. | 96.7           |
| 15.| Students were more motivated in learning when using electronic book Invertebrate. | 100            |
| 16.| Through the learning process using electronic book Invertebrate, students can access material every time and everywhere. | 100            |
| 17.| Students can look at the stages of information search related to Invertebrate sub material on the internet using search engines through the feature of “mari kita lihat” and “Info +”. | 93.3           |
| 18.| Students can identify hypertext navigation in web browser related to Invertebrate sub material through the feature of “Info +” and “Mari menjelajah”. | 96.7           |
| 19.| Students can evaluate the validity of information content related to Invertebrate sub material through the feature of “Mari menjelajah”. | 96.7           |
| 20.| Students can managed information related to Invertebrate sub material in the form of new facts and opinions found online through the feature of “mari menjelajah”. | 100            |

| Total Average (%) | 97.4 |

The pre-test results in both control and treatment classes revealed that 100% of students scored under the minimum standard on digital literacy and learning outcomes so that all students declared as not mastery. This was because students have not got the prior knowledge about Invertebrate and digital literacy material. According to Shepherd & Tello [13] a material delivered by the teacher will be fully understood by students if students have gained prior knowledge regarding the material. Therefore, prior knowledge was necessary for students to form material concepts.

After learning using electronic book Invertebrate was applied, digital literacy skills and student learning outcomes had increased. All treatment class students experienced an increase in digital literacy.
because students learn to use electronic book Invertebrates which contain features that facilitating digital literacy. The difference in students’ digital literacy skills is because the level of understanding of each student related to digital literacy taught was different, influenced by various factors. In accordance with Lee [14] that students’ environmental factors are related to scores and levels of digital literacy. According to Jan [12], students who are accustomed to processing technology can have high digital literacy. Also, the aspects of learning outcomes between the two classes get a percentage of 100% which has increased. This is because, in learning, improving learning outcomes is caused by several factors, both internal and external. Some of them are mastery the material, efforts of students to learn, ability and motivation, and other factors[15].

In contrast with the control class, 100% of students increased in a low category. This is because, in the control class, electronic book Invertebrate was not applied, so learning took place only in the school. However, there was a student in the control class who has a higher digital literacy pre-test and post-test score than the other students. The students' digital literacy was reflected in the way they answer questions that cannot be answered by other control class students below:

“In question number 1, to find relevant information about Porifera, I should enter Porifera key as an antibacterial and choose articles on the website journal.plos.org. I did not choose www.brainly.co.id because it uses a free domain and cannot be trusted. I do not choose the wordpress.com website because it contains answers that can be written by people who are not experts. I do not choose any website that is in the top search because it is only based on the number of webs that are clicked the most.” (Student number 4 in the control class)

The answer written by student number 4 of the control class was different from the other students because the student has prior knowledge about digital literacy at his home. This prior knowledge helped him to elaborate new information with what he had learned before. This is consistent with Yuksel [16] that prior knowledge helped students to understand and draw a framework of the topic. Also, according to Hargittai [17], personal use and experience influenced the level of digital literacy skills. However, other control class students do not have this ability. The average achievement of learning indicators using Invertebrata electronic book in the digital literacy aspects of the treatment class and aspects of learning outcomes are declared as mastery. Whereas in the control class, aspects of digital literacy declared in mastery and aspects of learning outcomes declared as mastery. According to Uno & Koni [18] the achievement of an indicator is said to be mastery if the average percentage of achievement is around 70 to 90%.

The highest achievement of the digital literacy indicator in the treatment class was indicator 3.9.9, which evaluate the validity of information content related to Invertebrate sub material in the score of 79.5%. Previously, the achievement of students' digital literacy indicators on indicator 3.9.9 was 18.8%. Before learning using the electronic book, almost all students cannot answer the questions given correctly. Students do not understand how to evaluate the validity of information content. As in one example of student answers:

“The website for accessing information about Coelenterata is https://id.m.wikipedia.org/wiki/cnidaria because Wikipedia often appears at the top of the search and is recommended.” (Student number 15 treatment class)

“Information from Facebook regarding photos of worm sightings living in sardines, I chose to spread the news to social media. This is because by spreading the news, we can invite people around to be more vigilant.” (Student number 24 treatment class)

The answers written by students number 15 and 24 of the treatment class were a reflection of the most answers to other treatment class students. This indicated that the treatment class students before learning using electronic book Invertebrate, do not have the skills to evaluate the validity of information content. However, after learning using the electronic book, most students were able to choose trusted websites based on educational domains such as .edu, .ac.id, and .ac.uk. As in one example of student answers:
“The website to find out information about leeches is at http://www.ucmp.berkeley.edu/Hirudinea because on the website there are .edu domains, which is educational websites.” (Students number 15 is a treatment class).

Besides, after learning with an electronic book, students can answer correctly when given information that was not undoubtedly true. Students have been able to choose to hold the spreading of the information and find the truth through various trusted sources. As in the number 2 post-test digital literacy item regarding the choice of action against leech information in kale that lives in the human intestine even though it has been cooked. There are students who write the answer:

“It is better to keep the news spread because before spreading the news, we have to look for information related to the truth of the news in order to avoid hoax.” (Student number 12 treatment class).

“It is better to keep the news spread because leeches are ectoparasites which can only grow or live outside the body. So that the news is not true or false.” (Student number 5 treatment class).

Almost all students in the treatment class answered questions like in number 2 correctly. It was because in electronic Invertebrate book, especially related to leech discussion (Chapter 5 Annelida) there is a menu “Mari menjelajah” which facilitate students to find reliable sources of information on the internet through trusted websites such as ww.animaldiversity.org, www.oceanografi.lipi.go.id, www.ucmp.berkeley.edu, www.cdc.gov and scientific articles we can access such as in www.mri.journal.or.id, www.e-journal.biologi.lipi.go.id, and www.citeseer.ist.psu.edu to train the ability to evaluate the validity of information content [8].

The process of finding reliable information can finish well, because there were clear guidelines, systematic paths, and equipped with links in the book. This is consistent with Embong et al. [19] that good electronic book display navigation of hypertext links, multimedia objects, and technology access guides. In addition, the information presented in the book is a contextual phenomenon that commonly happens in the community, so students can easily understand it. Evaluation of information content (Content Evaluation) is one of the critical digital literacy competencies [2]. According to Metzger & Flanagan [20], evaluation of online information content was to determine the information received, whether it is trusty or not. Through the feature of "Mari Menjelajah", students also asked to elaborate their searching results in the form of essay. This menu was found in each chapter of the book so that students were able to evaluate thoroughly.

In addition, the indicator of manage information related to Invertebrates in the form of facts and opinions that have been found online (knowledge assembly), get the lowest percentage, in the score of 56%. Some students answer correctly, but the steps were incomplete, such as:

“In fact, in the human stomach, there is chloride acid which makes the worms that enter the body die. Also, at the time while sardines preserved, it must be through a heating process. Thus, if there is a worm or other animals, it will die. The news presented is not correct.” (Student number 15 treatment class).

This is because processing and building information in the form of facts and opinions are indicators that still need to be accustomed to students. There are still many students who provide incomplete answers. Students are less able to elaborate on some data related to the questions presented. Under the statement of Moreno & Park [21] students who have high initial knowledge will be able to integrate various complex information elements with existing schemes, and can process them as one of the memory systems. Also, Ngilawajan [22] revealed that information processing by students is done by linking information received with the knowledge that is possessed. Therefore, strong initial knowledge will help students build and combine information and students need to get used to processing information online so that their abilities increase rapidly.

In the aspect of learning outcomes, the highest indicators mastery in the treatment class was found in indicator 3.9.2, whereas in the control class, the indicator with the highest mastery was indicator 3.9.4. Before the learning process, 14% of students answered correctly on indicator 3.9.4, then increased to 92.2%. The highest indicator in these two was because, explaining and describing was a simple level of
cognitive process, which is included in the cognitive level of understanding (C2) [23]. Therefore, many students answer correctly on this indicator. On the other hand, the lowest mastery in the treatment class is found in indicator 3.9.3, with a percentage of 54.2%. Before learning, only 4% of the control class answered correctly on indicator 3.9.3. This is because students are less accustomed to dealing with questions with a higher cognitive level. Analysing in Bloom's Taxonomy is a reasonably high level of cognitive process dimensions (C4) [23]. This is also supported by the research of Surbakti & Napitupulu [24] that the assessment of “analyse” level questions is one of difficult by students in addition to evaluating (C5).

The results of the statistical tests in Table 1 have four parameters tested to prove the hypothesis proposed, whether there is an influence of the electronic Invertebrate book on the digital literacy abilities of high school students grade 10. Based on the non-parametric statistic test, Wilcoxon, with the significance level of 95%, there are differences in the digital literacy of students before and after treatment. This was because 100% of students experienced a significant increase in digital literacy after being given learning using electronic book Invertebrate. Unlike the control class, there was no difference in students' digital literacy before and after treatment. This was because learning in the control class does not use electronic Invertebrate book. According to Vrana’s research [25], digital literacy positively influences student academically. Also, digital literacy plays a role in developing students' knowledge of certain subjects by encouraging high creativity and curiosity [26]. Therefore, digital literacy of students can increase after learning using electronic Invertebrate book.

The results of statistical tests in Table 3 have four parameters tested to prove the proposed hypothesis, whether there is an effect of using electronic book Invertebrate on the learning outcomes of high school students grade 10. Based on the t-test in the treatment class with 95% significance level, there was a difference between student learning outcomes before and after treatment. This difference is because the electronic book contains Invertebrate material which visualised into text, images, schemes, videos, and links that connect to other learning resources so that student learning outcomes can increase as a result of learning. According to Pradina & Suyatna [27], the contents of electronic book consist of videos, images, texts, and animations can make it easier for students to visualise abstract concepts. Lai [28] also revealed that electronic book that transformed into three-dimensional forms containing multimedia such as video and animation could stimulate students' enthusiasm and interest in reading and make the learning atmosphere more lively and enjoyable. Research by Herrlinger et al. [29] showed that the presence of images could improve learning outcomes. In addition, with the presence of animation and video, students can quickly learn abstract material and relate it to previous knowledge [27]. Thus, electronic book played a positive role in increasing student learning outcomes. Similar to the control class, there was a difference in student learning outcomes before and after treatment. Both the treatment and control classes experienced a significant increase in learning outcomes, so there were no normalised gain score differences between the learning outcomes of the two classes. This is caused by several factors that can influence student learning outcomes, such as in Soleh et al., [15], learning outcomes can be influenced by internal and external factors of students. In addition, the material content taught in electronic book Invertebrate and school book has the same weight, so the material absorbed by students in both classes was same.

Students respond very well to the learning process and the application of digital literacy skills. Not all students give a positive response to all specified aspects. There were two students who were still having trouble looking at the stages of information searching on internet related to Invertebrate using search engines through the features of “Mari kita lihat” and “Info+” that existed in the book. Such as the answer to a student:

“Electronic book contains many webs which delivered in English, making it difficult.” (Student number 2 is a treatment class).

This is because each web page has a different display and language of instruction, and students have difficulty understanding web pages that mostly use English. Even so, students need to be trained to take advantage of caption options (on videos available on Youtube), Google Translate, and page translation options available in the web browser. This guide is listed in the "Usage Instructions" page.
Knight [30] stated that technology built on reliable content to support students in manipulating material and engaging in learning is a useful educational technology. Thus, technology is useless without valid content. An understanding of information content requires the integration of various aspects, and using technology not only to access information but to identify and evaluate it [31]. Therefore, students need to be accustomed to accessing various types of web browser views so that they can identify and evaluate them properly. Thus, learning using the electronic Invertebrate book that implemented has done very well. Electronic Invertebrate book has proven to be improving digital literacy and student learning outcomes.

4. Conclusions
Students’ digital literacy abilities increased. Invertebrate material, especially in the Nemathelminthes, Annelida, and Arthropod chapters, is facilitated using digital literacy learning. Learning using electronic book based on Invertebrate sub material influenced student learning outcomes. The mastery of student learning outcomes individually and classically has increased. Learning using electronic book based on Invertebrate sub material received very good responses from students.

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