



## The Development of Activity-Based Textbooks on Animalia-Invertebrate Materials for Senior High School 10<sup>th</sup> Grade Students

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### Abstract

Activity-based books contain features that emphasize students' activity. Therefore these books are suitable for Invertebrate learning, which requires practical activities. The purpose of this study was to produce activity-based textbooks on Animalia-Invertebrate material, which were valid, practical, and effective to be used by senior high school 10<sup>th</sup> grade students. Meanwhile, the specific purposes of this research were to describe the validity of instructional textbook based on content, linguistic, and presentation validity; to describe the practicality of activity-based book based on the implementation of learning as well as book readability of textbooks using Fry chart; to describe the student's and teacher's response to the ease of use of activity-based textbooks on Animalia-Invertebrate materials, and to describe the effectiveness the activity-based textbooks on Animalia-Invertebrate material by senior high school 10<sup>th</sup> grade students. This developmental research was referred to 4D model (define, design, develop, and disseminate), but the disseminate stage was not done. The limited trials were involving 20 students and three biology teachers. The validation data, the practicality data based on implementation and readability, student's responses, the teacher's responses, as well as the effectiveness of the books were analyzed descriptive-quantitatively. The results showed that the developed teacher's and student's textbooks got a valid category mode. The percentage of textbook implementation was 100% and the textbook readability was at the level of legibility of 10. In addition, the students gave positive responses; the average of positive score was 99.75% (positive category). In addition, the teachers also gave positive responses, the average score was 100%. The completeness of student learning in Animalia-Invertebrate material (cognitive and psychomotor domain) get an average percentage score of 90% with the effective category. Hence, it can be concluded that the textbook was very valid, practical, and effective to be used for Biology learning.

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## INTRODUCTION

One of the materials in Biology learning is listed in the 2013 Curriculum for High Schools, which is regulated in Minister of Education and Culture Regulation No. 24 of 2016 is Animalia (including invertebrate) material. This material studies the classification of the invertebrate animal phyla based on body layers, body cavities, body symmetry, and reproduction.

In general, in learning Biology Animalia material is taught by using lecturing and presentation methods. Nisa, et al (2016); Arafat et al (2012); Sistriyani et al (2012); and Adityarini et al (2013) stated that in learning activities Animalia material in class was carried out by lecturing methods and informal discussion using PowerPoint slides as well as assignments. Hence, the active student activities or roles tend to decrease and can impact on learning outcomes that are less than the maximum. On the other hand, research conducted by Davis-Berg (2011) showed that Animalia-Invertebrate learning conducted using training methods or laboratory practices combined with class discussion methods gives good results. By applying this method, a significant result is obtained, namely, the students can not only memorize facts about Animalia-Invertebrate material, but also can understand the basic concepts in Invertebrate material independently.

One way that can be taken to understand the material and improve the student learning outcomes in learning activities is by using learning resources. Facts in the class showed that around 90% of science teachers utilize textbooks in almost 90% of the allocation of learning time (Adisendjaja and Romlah, 2007). Furthermore, Adisendjaja and Romlah (2007) also revealed that the success of the education of students is one of them determined by the existence of textbooks. This was in line with Aagard and Skidmore (2009) which stated that the use of textbooks is one of the strategies for the success of a learning activity.

Textbooks are expected not only to be used when learning in class, but also to facilitate students' hands-on activities. Based on studies conducted by Rakmawati and Ambarwati (2018), it is known that textbooks used in schools in the Surabaya region tend to have complete content, but lack of activity content. Three of the ten textbooks analyzed contained content that allowed students to think independently and carry out activities directly related to learning. On the other hand, seven other textbooks have activity content that tends to be lacking, hence the students' motivation and interest in books will also tend to decrease. The content in the seven textbooks were more suitable to be applied to the curriculum that emphasizes the role of the teacher than the curriculum based on student center. In fact, activity-based books or books that prioritize activities are books that contain features that emphasize student activities in classroom learning activities so that it was very important to apply to learning in this era. In addition, activity-based books can also guide students to discover their own concepts learned, because their use will involve many senses (Indriyanti et al, 2016).

The purpose of this study was to produce activity-based textbooks on Animalia-Invertebrate material for 10<sup>th</sup> class high school students that were valid, practical, and effective. In addition, the specific purposes of this study were to describe the validity of activity-based textbooks on Animalia-Invertebrate material for grade 10<sup>th</sup> high school students based on content validity, language validity, and presentation validity; describe the practicality of activity-based textbooks on Animalia-Invertebrate material for grade 10<sup>th</sup> high school students based on the implementation of learning and readability of textbooks using Fry charts; describe students' and teachers responses about the ease of use of activity-based textbooks, and to describe the effectiveness the activity-based textbooks on Animalia-Invertebrate material for grade 10<sup>th</sup> high school students.

## RESEARCH METHOD

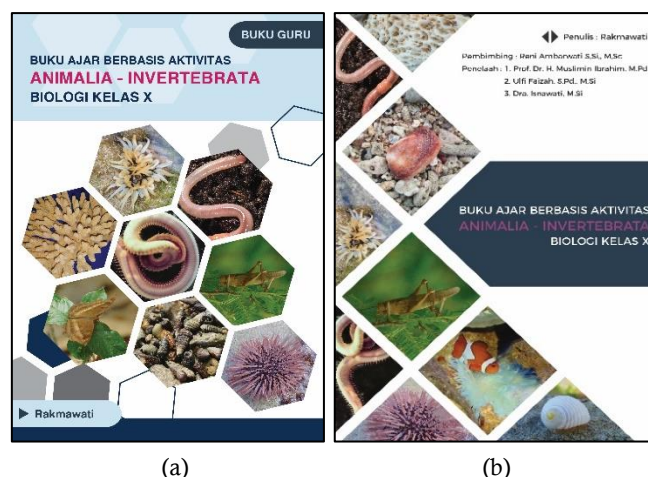
This research was conducted during August 2017 to March 2018. This study was developmental research that referred to the 4D development model (define, design, develop, and disseminate), but the disseminate stage was not carried out. The textbooks that were developed consisted of two types namely,

teacher's books and student's books. The book developed was equipped with features that facilitate eight types of student activities. Namely, visual activity, mental activity, writing activity, listening activity, motor activity, emotional activity, drawing activity, and oral activity. Specifically, in the teacher's book, besides there were eight types of student activities, the teacher's book was also equipped with learning steps and answer keys. Hence, the teacher can be guided when carrying out learning activities in class. The development phase was carried out at the Biology Department of FMIPA UNESA and the limited trials was involving 20 students of 10<sup>th</sup> grade of Senior high school 12 Surabaya.

The validity of textbooks was measured based on expert judgment; the practicality of textbooks was evaluated based on the implementation of the textbooks and the readability of textbooks using Fry charts. Meanwhile, the practicality that indicating the ease of textbooks usage was measured based on students' and teachers' positive responses. The instrument used to determine the validation of the textbook were a validation sheet instrument which was assessed by material experts, education experts, and media experts based on content validation, presentation validation, and language validation. Activity-based textbooks developed were classified as valid if the overall mode of validation results reached  $\geq 3$ . The instrument used to determine the practicality of the textbooks developed was the instrument of observing the implementation of the textbooks and Fry's readability charts. Activity-based textbooks were categorized as practical if the average score of the implementation of textbooks reached  $\geq 71\%$  with practical categories and readability of textbooks at grade 10. Meanwhile, the students' and teacher's responses sheet instruments were used to determine the ease of use of textbooks. The textbooks were categorized as easy to use if the average positive response score of students reaches  $\geq 71\%$  with a positive category.

## RESULTS AND DISCUSSION

The development research that has been carried out produces activity-based Biology textbooks on Animalia-Invertebrate material for high school/MA grade 10<sup>th</sup> students that are valid, practical, and easy to use. The activity-based textbooks produced consisted of three components, namely the introductory component, the content component, and the closing component. The introduction to the textbook that was developed consisted of the cover of the title of the book, the cover of the book, the introduction, preface, and table of contents (Figure 1).



**Figure 1.** Introduction to the textbook: (a) the cover of the book's title and (b) the cover of the book

The contents of the activity-based textbooks that were developed containing Animalia-Invertebrate material schemes and the contents of each chapter. Each chapter consisted of the main chapter division page, a second chapter division page, and a description of each chapter (Figure 2). Each chapter contains features that facilitate eight activities of students, namely visual activities, mental activities, writing activities, listening activities, motor activities, emotional activities, drawing activities, and oral activities.

The eight features contained in the textbook developed were the features “Did you know”, “Let's

observe”, “Let’s Exercise”, “Let’s conclude”, “Let’s get to know this phylum further”, and “Let’s practice”. Specifically in Chapter 1, there is no feature in “Let’s get to know this phylum further” because in Chapter 1 is a preliminary chapter. But it was replaced by the “Let’s discussion” feature which facilitated students to carry out discussions about the phylogeny of invertebrates. At the end of the chapter, there is a feature that reflects KD 4, the “Let’s report” feature. Meanwhile, in the closing part of the book there are four parts, namely the material summary, glossary, bibliography, and the back cover of the book (Figure 3).

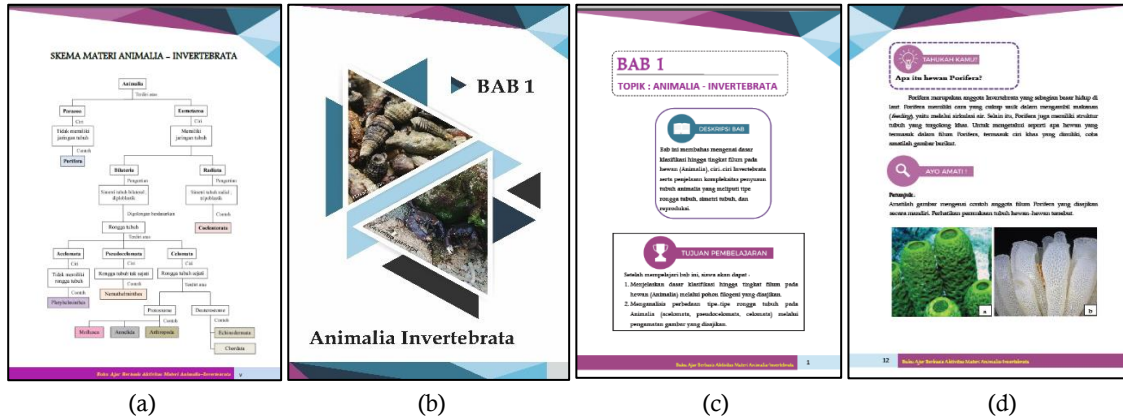


Figure 2. Sections of activity-based textbooks: (a) Animalia-Invertebrate material schemes; (b) limiting the main chapters; (c) limiting the second chapter; (d) examples of activity features

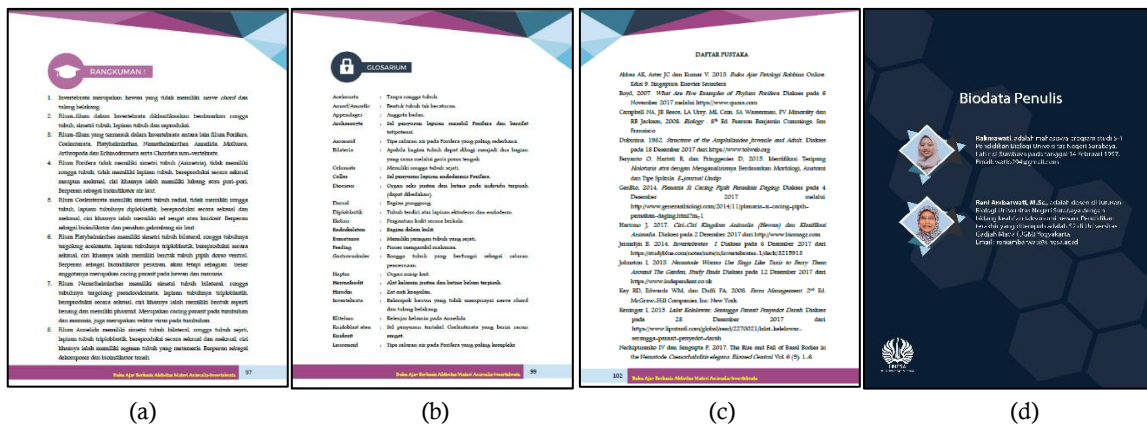


Figure 3. The concluding section of activity-based textbooks: (a) summary of Animalia-Invertebrate material; (b) glossary; (c) bibliography; and (d) the back cover of the book

The resulting textbooks consisted of two types, namely teacher's books and student's books. The two types of books developed contain three main parts, namely introduction, content, and closing. In the teacher's book, in addition to containing three main textbook sections, it also contains learning steps and answer keys that can guide the teacher in carrying out learning activities in class. Teaching textbooks developed were assessed as being feasible by educational experts, media experts, and material experts based on aspects of content validity, linguistic validity, and presentation validity. The results of the validity show that the textbooks developed have obtained a very feasible category mode score (Table 1).

In the content eligibility component consisting of nine assessment criteria, the results of the validation of the textbook in this component get a very feasible category mode value. Activity-based textbooks that are developed already have sections that match the textbook criteria. In addition, the activity-based textbook developed also has several advantages, namely the book is equipped with features that can encourage students to carry out activities and find their knowledge independently. The features

presented are features of “Did you know”, “Let's observe”, “Let's exercise”, “Let's discuss”, “Let's get to know this phylum further”, “Let's conclude”, “Let's practice”, and “Let's report”.

The activity-based textbook developed also presents examples of animal species in their natural habitats (in the environment around students), for example, pictures of members of the Porifera phylum in marine habitats, pictures of members of the Mollusca phylum, namely sea slugs on seashore rocks, and figure of Echinodermata phylum, which is sea urchins on the beach. The quality of the paper in textbooks is classified as good and is equipped with chapter descriptions, learning objectives, and concept maps of Animalia-Invertebrate material so that it will facilitate students in learning and developing their knowledge. The Ministry of National Education (2008) explained that the contents in the book must contain facts and concepts that are true and pay attention to the scope and accuracy of the material, so that students can achieve the standard competencies and basic competencies that are billed when using these textbooks in learning activities.

**Table 1.** Recapitulation of score or validation results data on textbooks based on activities in Animalia-Invertebrate material for high school/MA grade 10<sup>th</sup> students

No.	Criteria	Validator			Average	Category
		V <sub>1</sub>	V <sub>2</sub>	V <sub>3</sub>		
1.	<b>Content Eligibility</b>					
a.	The suitability of the material in the textbook with core competencies (KI) and basic competencies (KD)	4	3	4	3.67	Very valid
b.	Material coverage and accuracy	4	4	3	3.67	Very valid
c.	Update of the content	4	4	4	4	Very valid
d.	Develop skills and stimulate curiosity	4	3	4	3.67	Very valid
e.	Recency of features	4	4	4	4	Very valid
f.	Presents concrete examples from the local/national/regional/international environment	4	4	3	3.67	Very valid
g.	Activities in the textbook	4	4	4	4	Very valid
h.	Activity based text-book criteria	4	4	4	4	Very valid
i.	References	4	4	4	4	Very valid
	<b>Mode</b>					<b>Very valid</b>
2.	<b>Presentation</b>					
a.	Presentation technique	4	4	4	4	Very valid
b.	Supporting presentation of material	4	4	4	4	Very valid
c.	The physical form of textbooks	4	4	4	4	Very valid
d.	The type and size of letters used in textbooks	4	4	4	4	Very valid
	<b>Mode</b>					<b>Very valid</b>
3.	<b>Linguistic</b>					
a.	Use of Language	4	4	4	4	Very valid
b.	Language Structure	4	3	4	3.67	Very valid
c.	Use of symbols, terms and words	4	4	4	4	Very valid
	<b>Mode</b>					<b>Very valid</b>
	<b>Overall category mode</b>					<b>Very valid</b>

Note:

V1 (Validator 1): Animalia-Invertebrate Material Expert

V2 (Validator 2): Media Expert

V3 (Validator 3): Educational Expert

In the presentation component, four criteria were validated by experts, namely the criteria for presentation techniques, supporting the presentation of material, the physical form of textbooks, and the type and size of letters used in textbooks. All four criteria got a very valid category validation score. The textbooks that have been developed have presented drawing numbers and tables, present interesting illustrations, the quality of the paper is quite good, as well as the presentation of the features of the activities

are also consistent. This agrees with what was presented by Susanti (2013) that textbooks will be categorized as good and fit for use if presented in an interesting form so that students can understand all the contents and material presented.

The third component is the language component. This component gets a very valid category mode value. There are three validated criteria in this component, namely the criteria for language use; language structure criteria; and the criteria for using symbols, terms and words. This component gets a very valid category mode score, so it meets the requirements of the linguistic component. Nurlaili (2011) explained that language is a means of delivery that includes discourse, sentences, paragraphs, and vocabulary. If the use of sentence structure is clear, it will be easier for students to understand the material being taught.

Readability of textbooks is also one component used to determine the practicality of textbooks developed. The results of the conversion of nine paragraph samples representing each chapter in the textbook on the Fry readability chart are ranked 10<sup>th</sup>, which means they are suitable for high school students in grade 10<sup>th</sup> (Table 2). Himala (2016) and Jie (2012) explained that textbooks are categorized well if the number of sentences and syllables in the discourse is appropriate and the grammar contained therein can be understood by students according to their grade level. Readability in textbooks is considered important because it can influence the objectives in classroom learning activities (Fadilah and Mintowati, 2016; and Nurlaili, 2011).

**Table 2.** Readability test results on nine sample paragraphs in the activity textbook developed

No.	Paragraph Samples	Σ Sentences	Σ Syllables	Σ Syllables x 0.6	Level
1.	Chapter 1: Animalia-invertebrates	8	272	163.2	10
2.	Chapter 2: Phylum Porifera	6.17	266	159.6	10
3.	Chapter 3: Phylum Coelenterata	6.1	266	159,6	10
4.	Chapter 4: Phylum Platyhelminthes	7	269	161.4	10
5.	Chapter 5: Phylum Nematelminthes	8	272	163.2	10
6.	Chapter 6: Phylum Annelida	5.12	257	154.2	10
7.	Chapter 7: Phylum Mollusc	5.8	263	157.8	10
8.	Chapter 8: Phylum Arthropods	8.4	267	160,2	10
9.	Chapter 9: Phylum Echinoderms	8,12	272	163,2	10

The results of the validity of textbooks that were included in the category were very feasible or valid, as well as the readability test results of textbooks whose ranking reads according to grade 10<sup>th</sup> level will certainly be directly proportional to the results of other practicality tests, namely the implementation of activity-based textbooks. When conducting the feasibility test, the researcher took two sample chapters and one additional feature as the feasibility test sample, namely Chapter 1 which discusses Animalia-Invertebrates, Chapter 2 regarding the Porifera phylum, and the Let's Report feature. That is because the features of each chapter in the textbook have been consistent, and the overall features in the textbook have been represented through two chapters that were tested for their implementation, namely Chapter 1 and Chapter 2.

In the feasibility test using sample Chapter 1, six features facilitate students to move. In the feature Did you know, students do reading and visual activities, namely reading about the general characteristics of Invertebrates and the basic classification of Animalia-Invertebrates at the phylum level which includes body symmetry, body cavity, body layers, and reproduction. In the Let's observe feature, students observe the differences in three types of body cavities, namely acelomate, pseudoselomate, and celomate.

Meanwhile, on the Let's Exercise feature, students do writing activities, doing exercise questions about the differences in the three types of body cavities. Likewise in the Let's Conclude feature, students also do writing activities, which concludes learning activities about Animalia-Invertebrates by working on the questions on the feature. Furthermore, students are directed to do writing activities, visual activities, and listening activities through the Let's Discussion feature, namely students discussing phylogeny invertebrate trees. After discussion, students do the writing activity again, namely through the Let's Practice feature.

In the feasibility test using a sample of Chapter 2, six features facilitate the activities of students. In the Did you know feature, learners do the reading activity, which is reading about a brief description of the habitat and how to search for members of the Porifera phylum. In the let's observe feature, students observe the characteristics of the members of the Porifera phylum through observing the morphological images of Porifera. Meanwhile, on the Let's Exercise feature, students do writing activities, namely doing exercises about the anatomical components of the Porifera phylum.

Furthermore, students are directed to perform mental activities, visual activities, and motor activities through the Let's Get to Know Phylum Porifera Further feature, namely students carry out practical activities, namely observing Porifera anatomy of spicules and spongin fibers. After that, the students conclude learning activities about the Porifera phylum by working on the questions on the feature, and at the end of the feature session, students engage in emotional activities by interpreting the learning activities about the Porifera phylum. Likewise in the Let's Practice feature, students also do writing activities, i.e., do the practice questions on the feature.

After conducting the feasibility test on two sample chapters selected, students are given the opportunity to read all the material in the textbook. Then, students are directed to the Let's Report feature that facilitates writing and drawing activities. Learners draw tables about the comparison of the complexity of the compilers of body cavities, body symmetry, body layers, and reproduction in phylum of invertebrate members.

The results of the observation analysis of the implementation of the textbook show that all students can carry out activities according to the instructions in the textbook well. This can be seen from the acquisition of the percentage of the implementation of textbooks by 100% in the category of very practical (Table 3), which means students can easily carry out activities instructed in textbooks developed by researchers so that they are relevant for use in classroom learning activities.

**Table 3.** Recapitulation of observations of the implementation of activity-based textbooks on Animalia-Invertebrate material

No.	Activities in textbooks	Percentage (%) Student Activity Value	Categories
<b>Chapter 1: Animalia-invertebrates</b>			
1.	Did You Know: Students read the initial information about Animalia-Invertebrates and the basis of classification in the kingdom of Animalia.	100%	Very Practical
2.	Let's Observe: Students observe and analyze pictures about the different body cavities in the Animalia kingdom, then fill in the differences in the three body cavities in the table.	100%	Very Practical
3.	Let's Exercise: Students work on questions related to the results of the analysis of differences in body cavities in Kingdom Animalia.	100%	Very Practical
4.	Let's Conclude: Students conclude by answering questions about learning in Chapter 1.	100%	Very Practical
5.	Let's Discussion: Students discuss the classification tree phylogeny in the Animalia kingdom then answer the questions that have been provided.	100%	Very Practical
6.	Let's Practice: Students answer the enrichment questions about the material in Chapter 1.	100%	Very Practical
<b>Chapter 2: Phylum Porifera</b>			
1.	Did You Know: Students read the initial information about the Porifera phylum.	100%	Very Practical
2.	Let's Observe: Students observe Porifera's body surface through the picture presented, to then determine the characteristics of members of the Porifera phylum.	100%	Very Practical
3.	Let's Exercise: Students observe the anatomical images of the body of the Porifera presented, to then determine the	100%	Very Practical

	characteristics of the members of the Porifera phylum.		
4.	Let's Get to Know Porifera Further: Students make observations of the anatomy of the Porifera spicules which form the basis of classification up to grade level in the Phylum Porifera, to then record it in the table provided.	100%	Very Practical
5.	Let's Conclude: Students conclude by answering questions about learning in Chapter 2.	100%	Very Practical
6.	Let's Practice: Students answer the enrichment questions about the material in Chapter 2.	100%	Very Practical
<b>End of Chapter Charges</b>			
1.	Let's Report: Students make written reports in tabular form that show the comparison of the complexity of the layers of the animal's body (diploblastic and triploblastic), body symmetry, body cavity and reproduction.	100%	Very Practical
<b>Average Percentage of Implementation of Textbooks</b>		<b>100%</b>	<b>Very Practical</b>

Activities in textbooks that are developed are easy to carry out, so that students are more active. Thus, students will want to be directly involved in the learning process or activities in class. According to Zhang (2008), activities in the learning process will affect most of the understanding of students, and these activities will occur if students want to be active and independent (Sardiman 2011). Prastowo (2013) also said that students who carry out activities in learning activities directly can be interpreted that the students have direct experience so that the motivation and learning outcomes obtained by students are more maximal than students who only get general learning materials.

Good in the practical implementation of textbooks will impact on students' responses to the textbooks that are developed. Students' responses to the textbooks developed by researchers were included in the very positive category, with a percentage of 99.75% (Table 4). Judging from the content presentation criteria, physical presentation criteria, and activity-based textbook criteria, all students gave very positive responses to the textbooks that were developed.

**Table 4.** Recapitulation of students' responses to activity-based textbooks on Animalia-Invertebrate material

No.	Rated aspect	Percentage (%) of Positive Student Responses
<b>A. Criteria for Presentation of Content</b>		
1.	Material Animalia - Invertebrates in this book are related to daily life.	100%
2.	Activity-based textbooks can support the implementation of student-centered teaching.	100%
3.	This textbook can encourage students to work in groups.	100%
4.	This textbook can help develop students' thinking processes.	100%
5.	This textbook can build students' knowledge independently.	100%
6.	Learners can check the extent of their understanding of the material by answering the questions provided in this textbook.	100%
7.	Learners can understand the concept of Animalia-Invertebrate material through this textbook.	100%
8.	This textbook attracts students' interest to learn it.	100%
<b>B. Criteria for Physical Presentation</b>		
9.	The appearance of this textbook is interesting.	100%
10.	How to present this textbook attract the interest and attention of students to read it.	100%
11.	The features of this textbook are interesting.	100%
12.	The illustrations (figures and tables) contained in this textbook support the understanding of Animalia-Invertebrate material.	100%
13.	The letters used in this textbook clearly read so that they are comfortable to read?	100%



<b>C. Language Criteria</b>		
14.	The language used in this textbook is easy to understand.	100%
15.	Sentences used in this textbook are easy to understand.	100%
16.	The terms used in this textbook are easy to understand.	95%
<b>D. Criteria for Activity Based Textbooks</b>		
17.	Activities in this textbook are interesting.	100%
18.	Activities in this textbook guide students to understand the concept of Animalia-Invertebrate material.	100%
19.	The activities in this textbook are easy to do.	100%
20.	Activities in this textbook can make students more active.	100%
<b>Average</b>		<b>99.75%</b>

Note: the number of students (n) = 20

However, in the language criteria there is one student who gives a less positive response to one of the aspects asked in the questionnaire, namely on the aspect of ease of terms used (getting a percentage of student responses of 95%). That is because there is a term in Invertebrate material that is difficult to pronounce, namely the term "pseudocelomata". To follow up on this, the researcher applies the habit of reciting the term "pseudocelomata" to students who have difficulty pronouncing the term. It is intended that students are accustomed to hearing and reciting the term so that it will facilitate students in learning material that uses the foreign term "pseudocelomata", especially material Animalia-Invertebrates. BSNP (2014) explained that one of the criteria for the feasibility of textbooks is in terms of language eligibility, one component of which is that textbooks present important terms in the material and their use must be consistent. In addition, Komalasari (2011) also explained that the existence of components of content worthiness, language and presentation in textbooks (including foreign terms) is very important, because it can help students to understand concepts in the material being taught.

In addition to student response questionnaires, questionnaires were also distributed to teachers to find out teacher responses to activity-based textbooks that were developed. The teacher's response to the development of this textbook is expected to be a benchmark for the successful use of textbooks in classroom learning activities. From this teacher's questionnaire, it can also be seen the quality of activity-based textbooks that are developed from the aspects of content, physical or presentation, language, and activities presented.

After disseminating the teacher's questionnaire responses to the activity-based textbooks developed, it was found that the teacher's response to the textbooks that researchers developed was included in the very positive category, with a percentage of 100% (Table 5). Judging from the content presentation criteria, physical presentation criteria, and activity-based textbook criteria, all teachers gave very positive responses to the textbooks developed. By obtaining these positive categories, it can be seen that the activity-based textbook developed is relevant to learning activities in the classroom, so it is expected to increase student interest in Animal-Invertebrate material.

**Table 5.** Recapitulation of teachers' responses to activity-based textbooks on Animalia-Invertebrate material

No.	Rated aspect	Percentage (%) of Positive Teacher Responses
<b>A. Criteria for Presentation of Content</b>		
1.	Material Animalia - Invertebrates in this book are related to daily life.	100%
2.	The material presented in the textbook is in accordance with Competency Standards (SK) and Basic Competencies (KD)	100%
3.	This activity-based textbook can support the implementation of student-centered teaching	100%
4.	With this textbook, students can work in groups	100%
5.	This textbook can help develop students' thought processes	100%
6.	This textbook facilitates students to develop their understanding	100%

	independently	
7.	Directions for activities in this textbook make it easier for you to carry out learning activities	100%
8.	This textbook attracts students to learn it	100%
<b>B. Criteria for Physical Presentation</b>		
9.	The appearance of this textbook is interesting.	100%
10.	How to present this textbook attract the interest and attention of students to read it.	100%
11.	The features of this textbook are interesting.	100%
12.	The illustrations (figures and tables) contained in this textbook support the understanding of Animalia-Invertebrate material.	100%
13.	The type, size and spacing used in this textbook is clearly legible so it is comfortable to read	100%
14.	Placement of layout (title, subtitle, text, and page number) is this textbook consistent with certain patterns	100%
<b>C. Language Criteria</b>		
15.	The language used in this textbook is easy to understand.	100%
16.	Sentences used in this textbook are easy to understand.	100%
17.	The terms used in this textbook are easy to understand.	100%
<b>D. Criteria for Activity Based Textbooks</b>		
18.	Activities in this textbook are interesting.	100%
19.	Activities in this textbook guide students to understand the concept of Animalia-Invertebrate material.	100%
20.	The activities in this textbook are easy to do.	100%
21.	Activities in this textbook can make students more active.	100%
<b>Average</b>		<b>100%</b>

Note: the number of teachers (n) = 3

In addition to giving their opinions related to content, presentation/physical, language, and the existence of activities in textbooks that have been developed, teachers who fill out questionnaires are also welcome to provide suggestions and input related to textbooks developed by researchers. The advice obtained from the teacher is the need for the addition of questions, which in solving them requires (higher order thinking skills questions).

Positive responses obtained from students and teachers are directly proportional to the effectiveness of books in supporting basic competencies in the cognitive and psychomotor domains. Based on the effectiveness test of textbooks based on activities in the cognitive and psychomotor domains that have been carried out, it is known that 90% of students get scores that have exceeded the minimum standard score (KKM) that has been set (Table 6).

**Table 6.** Score obtained by students during the limited trial run

No.	Student's Name Code	Cognitive Score	Psychomotor Score	Average Score	Score Completeness Category
1	S-1	81	87	84	Exceeds the minimum score (KKM)
2	S-2	81	94	87.5	Exceeds the minimum score (KKM)
3	S-3	86	82	84	Exceeds the minimum score (KKM)
4	S-4	82	88	85	Exceeds the minimum score (KKM)
5	S-5	92	91	91.5	Exceeds the minimum score (KKM)
6	S-6	92	84	88	Exceeds the minimum score (KKM)
7	S-7	80	87	83.5	Exceeds the minimum score (KKM)
8	S-8	80	85	82.5	Exceeds the minimum score (KKM)
9	S-9	84	98	91	Exceeds the minimum score (KKM)
10	S-10	81	93	87	Exceeds the minimum score (KKM)
11	S-11	81	83	82	Exceeds the minimum score (KKM)
12	S-12	87	86	86.5	Exceeds the minimum score (KKM)

13	S-13	82	96	89	Exceeds the minimum score (KKM)
14	S-14	82	89	85.5	Exceeds the minimum score (KKM)
15	S-15	68	81	74.5	Not reaching the minimum score (KKM)
16	S-16	74	81	77.5	Not reaching the minimum score (KKM)
17	S-17	94	93	93.5	Exceeds the minimum score (KKM)
18	S-18	85	83	84	Exceeds the minimum score (KKM)
19	S-19	83	85	84	Exceeds the minimum score (KKM)
20	S-20	91	88	89.5	Exceeds the minimum score (KKM)
<b>The percentage of achievement of the minimum value (KKM) classically</b>		<b>90%</b>	<b>100%</b>	<b>90%</b>	<b>Complete classical</b>

Note: Minimum standard score (KKM) = 78

Meanwhile, if traced one by one based on predetermined indicators, the percentage score of students completeness classically in the basic competence of the cognitive domain is 90%, while the percentage of students completeness classically in the basic competencies in the psychomotor domain is 100% (Table 7).

**Table 7.** The percentage of classical values when elaborated on each indicator in the cognitive and psychomotor domains

<b>Domain of Cognitive Assessment (KD 3)</b>		
<b>3.9</b>	<b>Classifying animals into phyla based on body layers, body cavities, body symmetry, and reproduction.</b>	
<b>Indicators of Competence Achievement (IPK)</b>	<b>Tasks</b>	<b>Percentage of Classical Learning Completeness</b>
<b>Chapter I : Animalia-Invertebrate</b>		
3.9.1	Explain the basic classification up to the level of phylum in animals (Animalia) based on body layers, body cavities, body symmetry, and reproduction	90%
3.9.2	Analyzing different types of body cavities in Animalia (acelomata, pseudocelomata, celomata)	100%
<b>Chapter II : Phylum Porifera</b>		
3.9.3	Identifying the characteristics of members of the Porifera phylum	90%
	1. Students are asked to observe Porifera's body surface through the picture presented, to then determine the characteristics of members of the Porifera phylum.	
	2. Students are asked to observe the anatomical images of the body of the Porifera presented, to then determine the characteristics of the members of the Porifera phylum.	80%
3.9.4	Explain the basis of classification to grade level in the Porifera phylum	90%
	Students are asked to make observations of the anatomy of the Porifera spicules which form the basis of classification up to grade level in the Porifera phylum, and then record it in the table provided.	

<b>Domain of Cognitive Assessment (KD 3)</b>		
3.9	Classifying animals into phyla based on body layers, body cavities, body symmetry, and reproduction.	
<b>Indicators of Competence Achievement (IPK)</b>	<b>Tasks</b>	<b>Percentage of Classical Learning Completeness</b>
<b>The average percentage of students mastery learning classically</b>		90%
<b>Domain of Psychomotor Assessment (KD 4)</b>		
4.9	Presenting a comparative report on the complexity of the constituent layers of animal bodies (diploblastic and triploblastik), body symmetry, body cavity and its reproduction.	
<b>Indicators of Competence Achievement (IPK)</b>	<b>Tasks</b>	<b>Percentage of Classical Learning Completeness</b>
4.9.1	Compile a written report in the form of a comparison table of the complexity of the layers of the animal's body (diploblastic and triploblastik), body symmetry, body cavity and its reproduction. Students are asked to make written reports in tabular form that show the comparison of the complexity of the layers of the animal's body (diploblastic and triploblastik), body symmetry, body cavity and its reproduction.	100%
<b>The average percentage of students mastery learning classically</b>		100%

A class can be categorized as a complete study classically if the percentage of students' completeness of the demands of the indicator is  $\geq 80\%$  (Susanti, 2014). Thus, it can be concluded that the activity-based textbooks developed are appropriate to be used in Animalia-Invertebrate learning activities in the classroom because they have reached the classical completeness standard, which is equal to 90%.

Based on the results of research that has been done, it is known that activity-based textbooks on Animalia-Invertebrate material developed by researchers in two versions, namely teachers textbook and students textbook. The students' textbook and teacher's textbook developed is equipped with features that facilitate eight types of student activities, namely visual activity, mental activity, writing activity, listening activity, motor activity, emotional activity, drawing activity, and oral activity. Specifically on the teacher's book, is also equipped with learning steps and answer keys. The activity-based textbooks that have been developed are declared valid, practical, effective, and easy to use. This was stated based on the validity of the textbooks which obtained a very valid category score, the implementation of the textbooks by 100% with a very practical category, the readability of the textbooks at the level of readability of 10, the positive responses of students getting an average of 99.75% with the category very positive, the percentage of positive responses from teachers who received an average of 100% in the very positive category, and completeness of student learning in Animalia-Invertebrate material (cognitive and psychomotor domain) get an average percentage score of 90% with the effective category.

## CONCLUSION

Based on the results of research that has been done, it can be concluded that activity-based textbooks on Animalia-Invertebrate material for high school/MA grade 10<sup>th</sup> students have been well developed. The textbooks that were developed in two types, namely teachers textbooks and students textbooks. The students' textbook and teacher's textbook developed is equipped with features that facilitate

eight types of student activities. Specifically on the teacher's book, is also equipped with learning steps and answer keys. The activity-based textbooks were declared to be very feasible with the results of the validation getting the very valid category mode. Implementation of textbooks by 100%, readability of textbooks is at the level of readability of 10, the percentage of positive responses of students who get an average of 99.75% with a very positive category, the percentage of positive responses from teachers who received an average of 100% in the very positive category, and completeness of student learning in Animalia-Invertebrate material (cognitive and psychomotor domain) get an average percentage score of 90% with the effective category. Thus the textbook is declared very valid, practical, effective, and easy to use in learning Biology.

## REFERENCES

- Aagaard L. dan Skidmore R. 2009. *College Student Use of Textbooks*. Paper Presented At The Annual Meeting of The MidSouth Educational Research Association, Baton Rouge, LA.
- Adisendjaja H.Y dan Romlah O. 2007. Analisis Buku Ajar Sains Berdasarkan Literasi Ilmiah sebagai Dasar untuk Memilih Buku Ajar Sains (Biologi). *BioUPI: 1-13*.
- Adityarini Y., Waluyo J., dan Aprilia S. 2013. Penerapan Model Pembelajaran Quantum Learning dengan Media Flashcard untuk Meningkatkan Motivasi dan Hasil Belajar Siswa Kelas X di SMA Negeri 1 Purwoharjo-Banyuwangi Tahun Pelajaran 2011/2012 (Pokok Bahasan Animalia). *Pancaran. Vol. 2 (2): 189-199*.
- Arafah S.F, Ridlo S., dan Priyono B. 2012. Pengembangan LKS Berpikir Kritis pada Materi Animalia. *Unnes Journal of Biology Education. Vol. 1 (1): 47-53*.
- BSNP. 2014. *Naskah Akademik Instrumen Penilaian Buku Teks Pelajaran Pendidikan Dasar dan Menengah*. Jakarta: Badan Standar Nasional Pendidikan.
- Davis-Berg E.C. 2011. Teaching the Major Invertebrate Phyla in One Laboratory Session. *The American Biology Teacher. Vol. 73 (5): 281-284*.
- Depdiknas. 2008. *Panduan Pengembangan Bahan Ajar*. Jakarta: Direktorat Jendral Pendidikan Dasar dan Menengah.
- Fadilah R. dan Mintowati M. 2016. Keterbacaan Buku Teks Bahasa Indonesia SMP dan SMA Kurikulum 2013 Terbitan Kementerian Pendidikan dan Kebudayaan 2014. *Jurnal Pena Indonesia. Vol. 1 (1): 26-49*.
- Himala S.P.T., Ibrahim M., dan Fitrihidajati H. 2016. Keterbacaan Teks Buku Ajar Berbasis Aktivitas Pada Materi Ruang Lingkup Biologi Kelas X SMA. *Bio Edu. Vol. 5 (3): 445-448*.
- Indriyanti D.P., Ibrahim M., dan Indah N.K. 2016. Validitas Buku Ajar Berbasis Aktivitas Pada Materi Keanekaragaman Hayati Bagi Siswa SMA/MA. *Bio Edu. Vol. 5 (3): 202-206*.
- Jie C. 2012. *A Survey of New Readability Formulas. Vol. 10 (12): 1779-1783*.
- Komalasari K. 2011. *Pembelajaran Kontekstual Konsep dan Aplikasi*. Bandung: Refika Aditama.
- Nisa A.Z., Alimah S., dan Marianti A. 2016. Pengaruh Penerapan Desain Pembelajaran Animalia dengan Model Experiential Jelajah Alam Sekitar di SMA. *Jurnal Lembaran Ilmu Pendidikan. Vol. 45 (1): 20-27*.
- Nurlaili. 2011. Pengukuran Tingkat Keterbacaan Wacana dalam LKS Mata Pelajaran Bahasa Indonesia Kelas 4-6 SD dan Keterpahamiannya. *Jurnal Universitas Pendidikan Indonesia (UPI). Vol. Khusus (1): 167-177*.
- Prastowo A. 2013. *Panduan Kreatif Membuat Bahan Ajar Inovatif*. Yogyakarta: Diva Press.
- Rakmawati dan Ambarwati R. 2018. Analisis Buku Ajar Biologi SMA Kelas X Materi Animalia-Invertebrata Berdasarkan Aktivitas. *Prosiding Seminar Nasional Biologi Inovasi Pendidikan dan Penelitian Biologi 2018 Universitas Negeri Surabaya: 16-20*.
- Sardiman AM, 2011. *Interaksi dan Motivasi Belajar Mengajar*. Jakarta: PT Rajagrafindo.
- Sistriyani D., Suwarsi E., dan Supriyadi. 2012. Pengembangan Perangkat Pembelajaran Materi Kingdom Animalia di SMA dengan Interactive Skill Station Supported By Information Technology (ISS-IT) untuk Meningkatkan Aktivitas, Motivasi dan Hasil Belajar. *Unnes Journal of Biology Education. Vol. 1 (1): 46-53*.
- Susanti R. 2014. Pembelajaran Model Examples Non Examples Berbantuan Powerpoint untuk Meningkatkan Hasil Belajar IPA. *Jurnal Pendidikan IPA Indonesia. Vol. 3 (2): 123-127*.
- Susanti R.D. 2013. Studi Analisis Materi Ajar "Buku Teks Pelajaran" pada Mata Pelajaran Bahasa Arab di Kelas Tinggi Madrasah Ibtidaiyah. *Jurnal Arabia. Vol. 5 (2): 199-223*.
- Zhang L.F. 2008. Preferences for Teaching Styles Matter in Academic Achievement: Scientific and Practical Implications. *Educational Psychology. Vol. 28 (6): 615-625*.