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PRELIMINARY STUDY OF STUDENT EXPERIENCES IN USING BIOLOGY TEXTBOOK BASED ON COLLABORATIVE LEARNING MODEL TO PRACTICE SCIENTIFIC LITERACY SKILLS

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Abstract: Science literacy skills are needed in 21st century learning. As a developing country, schools in Indonesia should create learning that is able to practice these skills. The learning strategy that requires students to explore and use scientific knowledge to solve problems is collaborative learning. The collaborative learning model is suitable for learning that is closely related to environmental problems, one of which is biology. Therefore, this study aims to determine the level of understanding of students related to biology (ecosystem) material, to find out students' experiences related to-based textbooks collaborative learning, and to find out the conditions of biology learning that have been applied in schools. This type of research is descriptive quantitative. The research subjects were 30 students of SMAN 1 Ngunut. Data collection techniques were carried out by observation, tests, and questionnaires. The sample of respondents was taken by purposive sampling on the advice of the Biology teacher. The results of this study are as follows: 1) In terms of the level of understanding related to biological material (ecosystem), it is classified as lacking. 2) Students' experiences in learning biology so far have never found the collaborative learning textbook. 3) Learning activities to practice scientific literacy skills are rarely carried out. After adding up the average percentage of each indicator, it is known that the students' understanding is still in the lacking category with a percentage of 44.8%, so that better knowledge and readiness are still needed so as to be able to achieve the 21st century learning goals. One of the steps to solve this problem is to use learning resources that train a lot of scientific literacy skills. The majority of teachers through the survey also agree that the limitations of learning media to train scientific literacy skills can be circumvented by developing textbook-based collaborative learning. Therefore, it can be concluded that textbooks based on collaborative learning model need to be developed.

Keywords: textbook, collaborative learning, ecosystem, scientific literacy

Introduction

Science literacy is the development of abilities based on scientific knowledge and skills that are relevant to real life, such as problem solving, decision making, attitudes and values (Roberts, 2007; Holbrook & Rannikmae, 2009; Dragos & Mih, 2015). Aulia, Poedjiastoeti & Agustini (2017) also define scientific literacy as the ability to include science issues, scientific ideas and become someone who thinks critically. This definition is supported by the Organization for Economic Cooperation and Development (2016), which states that scientific literacy is a competency that students must have by applying science as a scientific activity, which consists of identifying problems and drawing conclusions.

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Science literacy skills are one of the skills that are able to answer the demands of education in the 21st century, which include life and career skills, technology and information media skills, as well as learning and innovation skills which are divided into critical thinking, problem solving, communicating, collaborating and creative. Emphasis on the skills above needs to be done to lead students to be trained and have the skills to think and learn, so that they are able to compete in the global era. These skills are needed to prepare students in the future (Szpytma & Szpytma, 2019). Therefore, this skill must be trained to students more effectively (Udompong, *et al*., 2013).

In fact, based on the results of interviews and research surveys, some schools still have difficulty practicing scientific literacy skills effectively. In fact, if these skills can be trained properly, the quality of learning in schools will increase. Efforts to improve the quality of learning need to be done in order to achieve the expectations of the 2013 curriculum (Kemendikbud, 2016). One of the steps to solve this problem is to use learning resources that train students' scientific literacy skills a lot. These learning resources include textbooks, student activity sheets, modules, and others.

Books are a teaching material that supports the learning process (Kemendikbud, 2016). The clarity of principles, foundations and points of view that underlie books, the relevance of the curriculum, the ability of books to emphasize community values and train life skills to answer the 21st century are the criteria for a good textbook (Tarigan, 2009; Nurichah, 2012). Learning that is student-centered and based on real-life contexts, as billed in the 2013 curriculum, must be the basis for the preparation of textbooks. However, it should be remembered that to create a student-centered learning process an appropriate learning model is also needed. This statement is in line with the results of research by Dragos & Mih (2015) which states that to strengthen scientific literacy, it is important for teachers to understand the realities of education and the suitability of learning models with objectives.

The collaborative learning model is an example of an effective learning model, because it is centered on students and does not emphasize competence, so that in the learning process students who are more capable academically can help less fortunate students. In addition, the collaborative learning model is also said to be in accordance with three aspects of the science process, because it provides many learning experiences for students, expresses ideas and curiosity to solve problems as a group, and increases responsibility and tolerance between students (Wahyuni, 2016).

Textbooks based on collaborative learning model that are compiled will present various activities that can help students understand material with a broad scope. One of the materials for high school that has a broad coverage is ecosystem material. Ecosystem material is suitable for training scientific literacy skills because this material can be taught through the environment around students, so that students are trained to make observations of a phenomenon, evaluate and design scientific investigations and interpret data and evidence scientifically. Several subsections on ecosystem material can also be taught through practicum activities that require students to analyze and evaluate data to draw conclusions. For example in the section on the biogeochemical cycle, students are asked to ascertain the importance of the existence of plants in helping the biogeochemical cycle through practicum activities. The practicum activity in question can be carried out in collaborative learning-based learning, where students collaborate with each other to solve problems. These various reasons support the statement that textbooks based on collaborative learning model on ecosystem material is suitable for training students' scientific literacy skills.

As mentioned above, one approach that can be used to train scientific literacy skills is collaborative learning. Research that supports this statement includes research conducted by Wahdaniah, Rahmah & Kusumayanti (2018) which shows that collaborative learning-based textbooks are included in the logical validity and reliability category, so that they can be used as a support in implementing learning. Through a collaborative learning approach, art education students can also develop awareness of their own creative processes and use this process in group projects (Guyotte, *et al*., 2015). Collaborative learning-based learning has also been shown to increase students' writing fluency (DeMichele & Ozark, 2015). Based on the above statement, collaborative learning textbook on ecosystem materials need to be developed. To determine the level of knowledge and experience of students in using biology textbooks, prior to the development of textbooks, an analysis of the level of knowledge and experience of students in using biology textbooks was carried out. As a result, a preliminary study of student experiences in using biology textbooks based on collaborative learning model to practice scientific literacy skills was undertaken.

Research Methods

This type of research is quantitative descriptive research. The data collection method in this research is the interview method, the test method, and the questionnaire method. The instruments used in data collection in this study included (1) a student's knowledge test sheet on biology (ecosystem) material. (2) Questionnaire about experiences related to biology learning (3) Interview sheet for teachers.

The subjects of this study were 30 students of class X at SMAN 1 Ngunut. The data analysis used was univariate analysis. Univariate analysis was carried out on the variables used in this study, so that an overview of the frequency distribution of each variable under study can be seen. The results of the analysis will be presented in the form of a frequency distribution table. Sudijono (2011) states that the level of understanding of students related to biology material is divided into 3 categories (1) Low = If the subject is able to answer 0% - 30% correctly of all questions. (2) Moderate = If the subject is able to answer correctly 31% - 60% of all questions. (3) High = If the subject is able to answer 61% - 100% of all questions correctly.

This research was conducted with two different activities continuously, the first was a preliminary study to find out students 'experiences in learning biology and students' knowledge related to biology material. The next research stage was developing-based textbooks collaborative learning with the Borg & Gall (2007) development method, which consists of research and information collecting, planning, developing preliminary from product, preliminary field testing, main product revision, main field testing, operational product revision, operational field testing, final product revision, dissemination and implementation. The disseminate stage aims to implement textbooks and determine the effectiveness of textbooks in practicing scientific literacy skills.

Researchers are anticipated to have a solid foundation as a framework for future research, such as the development of based textbooks for collaborative learning. The new textbooks will have a variety of elements that will help students improve their reading abilities. After utilizing the collaborative learning model textbook, students' knowledge is predicted to improve significantly.

Results and Discussion

Results of interviews with teachers

Results of interviews with teachers

Teacher 1 is a biology teacher who has been teaching for 16 years. The teacher said that the level of understanding of students regarding biology (ecosystem) material was quite good, but their scientific literacy skills were lacking. This can be seen from the student learning outcomes that are not good if they answer questions in the cognitive domain above C4 and aim to train scientific literacy to them. The textbooks used so far only contain material without using a special approach / model that can help practice 21st century skills.

Results of interviews with teacher 2

Teacher 2 is a representative of the curriculum at SMAN 1 Ngunut. According to his opinion, so far the learning that has been carried out has been good enough. This is evidenced by several lessons that provide opportunities for students to share ideas with each other in solving problems. He realized that practicing scientific literacy skills which is one of the demands of 21st century learning needs to be applied in schools. Therefore we need a learning approach / model and media that can support the creation of student-centered learning. With the right learning resources, students can be trained to learn independently, explore their surroundings, share ideas and use scientific knowledge to solve problems.

Teacher Experience in Using Biology Textbooks

To find out teachers' experiences while using biology textbooks, 11 questions are used which are presented in Table 1

Table 1: Teacher Experience in Using Biology Textbooks

No	Questions related to Student Experiences in Using Biology Textbooks	Teacher answers (%)	
		Yes (n = 20)	No (n = 20)
1	Is the biology textbook that you have been using interesting?	10	90
2	Does the biology textbook that you have used provide features for practicum activities?	45	55
3	Is a biology textbook supposed to provide features for practicum activities?	100	0
4	Learning biology will be more interesting if practicum is done based on the instructions in the textbook?	100	0
5	In the era of the 21st century, is it important to practice scientific literacy skills?	100	0
6	Are you having trouble finding textbooks to practice scientific literacy?	85	15
7	Can the biology textbook that you use so far practice your scientific literacy skills?	20	80
8	Do you think it is important to provide alternative learning media to practice scientific literacy skills?	100	0

9	Do you think collaborative learning is suitable learning to practice scientific literacy skills?	100	0
10	Have you ever encountered collaborative learning textbook to train science literacy skills?	10	80
11	Are collaborative learning textbook to practice scientific literacy skills important to be developed?	95	5

Based on the table above, it is known that most teachers have difficulty finding learning media to practice scientific literacy skills. The teachers also agreed that the development of learning media to Teach scientific literacy skills was necessary. Researchers have provided an alternative in the form of textbook-based collaborative learning. Collaborative learning is considered suitable because it requires students to exchange knowledge with their friends, be active in learning and apply science to problem solving. This is in line with the opinion that collaborative learning emphasizes the importance of positive interaction between students because it involves two or more students working together on shared learning goals (Johnson & Johnson, 2009; Lou *et al*., 1996; Asterhan & Schwarz, 2016; Dillenbourg, 1999; Gillies & Boyle, 2008). The steps in collaborative learning are in accordance with the scientific literacy indicators initiated by the OECD (2016).

The low scientific literacy skills of Indonesian students (OECD, 2019) can be trained by designing students to become accustomed to using science in decision making. These skills, which include knowledge of science, science process skills and attitudes to science, are mandatory for every student (Fakhriyah *et al*., 2017). Learning from ecosystem materials designed with collaborative learning steps can provide various scientific observation activities. Through scientific observation, students are accustomed to analyzing, solving problems and making decisions by involving science in them.

The data shows that 15% have encountered collaborative learning-based textbooks, but the books found were on fungi. When they investigated further, the teacher explained that the books they encountered were only for development research and were not freely used in schools. This is an indication to researchers that if the motivation for developing collaborative learning-based textbooks is compelling and the textbooks developed meet expert criteria, they will be widely tested.

Students' Level of Understanding Regarding Biological Materials (Ecosystems)

The data obtained from the 18 questions given to 30 students are interpreted in the following table.

Table 2: Students' Level of Understanding Related to Biological Materials (Ecosystem)

No	**Questions related to biology material (ecosystem)**	**Student answers (%)**	
		True (n = 30)	**False (n = 30)**
1	Branch of science in biology that studies the interaction or reciprocal relationship between living things and their environment is called….	63,3	36,7
2	An example of a community is….	93,3	6,7
3	Ecosystem is defined as….	76,7	23,3
4	Ecosystems formed due to differences in geographic and astronomical locations	36,7	63,3
5	Teretrial biomes characterized by mostly herbaceous tundra vegetation, consisting of a mixture of moss, grass and some dwarf shrubs are…	23,3	76,7

6	Biomes characterized by high rainfall and relatively low temperature changes are …	30	70
7	Examples of fauna that can live in the intertidal zone	26,7	73,3
8	What biota live in estuary / eustary areas?	23,3	76,7
9	What is the biosphere?	36,7	63,3
10	What abiotic factors cause the differences in vegetation in each country?	63,3	36,7
11	Predict what will happen if Earth's temperature continues to rise to the extreme!	96,7	3,3
12	What are the benefits of forming terraces?	43,3	56,7
13	What would happen if there were no birds in the rice field ecosystem?	86,7	13,3
14	Why do trophic levels affect the role of organisms in energy flow?	26,7	73,3
15	Why is the water cycle not included in the biogeochemical cycle?	13,3	86,7
16	The process of reducing nitrate to nitrogen gas in the nitrogen cycle is called….	26,7	73,3
17	In the sulfur cycle, plants absorb sulfur in the form?	26,7	73,3
18	An example of allelopathy is….	13,3	87,7
	Average	44,8	55,2

The level of students' knowledge about the ecosystem after adding the percentage of each question then divided by the number of questions obtained by the result of 44.8% or in intervals of 3 knowledge categories according to Arikunto (2006), then stated in the lacking category.

Students' Experience in Using Biology Textbooks

To find out students' experiences while using biology textbooks, 8 questions are used which are presented in Table 3.

Table 3: Students' Experiences in Using Biology Textbooks

No	Questions related to Student Experiences in Using Biology Textbooks	Student answers	
		Yes (n = 30) %	**No (n = 30) %**
1	Is the biology textbook that you have been using interesting?	26,7	73,3
2	Does the biology textbook that you have used provide features for practicum activities?	36,7	63,3
3	Is a biology textbook supposed to provide features for practicum activities?	96,7	3,3
4	Learning biology will be more interesting if practicum is done based on the instructions in the textbook?	100	0
5	In the era of the 21st century, is it important to practice scientific literacy skills?	100	0
6	Can the biology textbook that you use so far practice your scientific literacy skills?	26,7	73,3
7	Have you ever encountered collaborative learning textbook to train science literacy skills?	0	100
8	Are collaborative learning textbook to practice scientific literacy skills important to be developed?	100	0

From table 2 it is known that all respondents have never encountered-based biology textbooks collaborative learning to train science literacy skills, and 73.3% of respondents feel the textbooks they use so far are not interesting. In fact, the attractiveness of textbooks is important to increase student interest (Okaffe 2013; Idrees & Hafeez 2014). The various activities that will be presented in the textbook invite students to carry out an activity that demands scientific work according to the opinion of other researchers, that science is knowledge and a process, so that science textbooks must also provide students with activities that can guide them to work on scientific processes systematically (University, 2019; Elvionita, Fauzi & Ratnawulan, 2019). The tasks in the textbook are carried out in groups, with the aim of students having the same cooperation and responsibility in solving these problems (Adholpus, 2013).

Conditions of Education and Learning Biology in Schools

In this questionnaire five questions are given about learning biology at SMAN 1 Ngunut which are presented in Table 4.

Table 4: Conditions of education and Biology Learning in Schools

No	Questions related to biology material (ecosystem)	Student answers	
		Yes (n = 30) %	**No (n = 30) %**
1	Had received practicum	96,7	3,3
2	Had received manual practicum book	36,7	63,3
3	Student center and practicing scientific literacy skills	16,7	83,3
4	Practicing collaborative learning	26,7	73,3
5	Had received collaborative learning textbook to train scientific literacy skills	0	100

Based on the table above, it is known that 96.7% of students stated that biology learning was equipped with practicum activities, but 63.3% of students stated that practicum manuals were not provided. In fact, the practicum guidebook is an important medium so that students can work continuously and directed (Arsyad, 2013; Kilinc, 2007). As many as 73.3% of students stated that the learning carried out was also not based on collaborative learning. Collaborative learning is one way to create an attractive and student-centered classroom atmosphere. A good learning process emphasizes students to be active in building knowledge individually, being responsible and taking the initiative to recognize their learning needs, so that teachers act as facilitators (Abdullah, 2017; Antika, 2014; Trinova, 2013; Kurniawan, Miftahillah & Nasihah, 2018). This is in line with the statement that social constructivism theory is a theory that underlies collaborative learning (L. Lin, 2015; Nordentofl & Wistoft, 2013). As many as 100% of students stated that they had never encountered-based textbooks collaborative learning. This collaborative learning textbook can be used to support learning (Wahdaniah, Rahmah & Kusumayanti, 2018), development of character education (Diana, 2016), and even train scientific literacy skills (Laily & Rachmadiarti, 2019; Khoirunnisa '& Rachmadiarti, 2019). Therefore, the various statements above support the importance of developing-based textbooks collaborative learning, especially on ecosystem materials.

Conclusion

Based on the knowledge test that has been carried out, it is known that the knowledge about the ecosystem material of SMAN 1 Ngunut students is still in the lacking category. Most of the respondents stated that the biology textbooks that have been used have not been able to train scientific literacy skills. Media and learning models are needed that can be used to increase students' knowledge of ecosystem materials as well as train scientific literacy skills. It is important to train students in scientific literacy skills as a provision to prepare them to be able to compete globally. The majority of teachers through the survey also agree that the limitations of learning media to train scientific literacy skills can be circumvented by developing textbook-based collaborative learning. Therefore it can be concluded that the development textbooks-based collaborative learning on ecosystem materials to train scientific literacy skills needs to be developed.

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