

Analysis of the need for science teaching materials based on environmental problems on the island of Bangka

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Abstract. This study aims to determine the need for teaching materials for natural science modules based on environmental problems due to tin mining on Bangka Island. This research uses a descriptive method. The instrument used in the form of a closed questionnaire and some questions use open questionnaire filled by 10 science teachers who teach in schools close to tin mining activities on Bangka Island. The instrument consists of 3 aspects with 11 indicators. The results of the analysis of the questionnaire found an average of the aspects of learning model aspects was 90%, the module's teaching material aspects was 76%, the need for a problem-based IPA module due to a tin mine on Bangka Island aspects was 70%. Then based on these analysis of each of these aspect and indicators it can be concluded that needed teaching materials based on environmental problems in the form of tin mining activities on Bangka Island on environmental pollution material for seventh-grade junior high school, so that it can be used in learning process.

Keywords: *science teaching materials, environmental problems*

1. Introduction

Natural science or science is a very broad object of study, which consists of a collection of concepts, principles, laws, and theories formed through scientific attitudes and discovery process skills and also has a very broad relationship related to human life [1]. Science discussion is also related to events that occur in nature. Science or Natural Science is science whose subject matter is nature with all its contents and what is learned in science is cause-effect, causal relationships from events that occur in nature [2].

Science learning in schools is preferred to be taught on a problem-based. This is based on the 2013 curriculum which has also been used in schools, that problem-based learning (PBL) is one of the recommended learning models for use in the learning process. Problems that are close to students are prioritized so that students become more familiar with the surrounding environment. So, it takes teaching material that contains material, examples, activities, and questions related to the problem. One of them is the PBL module of teaching materials. PBL is interesting learning strategies than students only reading or hearing about facts and concepts that define the field of academic study, students are invited to solve real problems and are faced every day [3]. PBL learning also requires students to be able to work together in solving problems. Problem-based learning is a constructivist pedagogical approach in learning where students work together to find more complex solutions [4]. PBL is a good learning model to support students' knowledge and skills [5]. Learning by using PBL is also an inquiry approach that is very helpful for teachers in explaining some aspects of Nature of Science [6]. Learning by using PBL can increase student attitudes toward science, problem-solving skills, and positive views of the learning environment



[4]. Implementation of problem-based learning models can improve academic achievement and influence learners' conceptual development [7].

Environmental problems in the form of pollution and environmental damage are some of the problems that are also learned by students in learning. This is in accordance with the 2013 curriculum which is on KI and KD 3.8 and 4.8 namely on environmental pollution material. The problem of pollution and damage to the local environment and being around students becomes an important issue that needs to be raised and linked in learning. One of them is the local environmental problem on Bangka Island, which is a problem due to the existence of tin mining activities that cause damage to the environment on land and at sea.

Bangka Belitung is one of the largest tin producers in Indonesia and contributes greatly to the world's demand for tin. Mining is carried out not only on land but also at sea or commonly called floating unconventional (TI) mines. However, mining activities are not yet based on environmental stewardship. The mining activity still leaves marks in the form of pollution and environmental damage. Environmental damage that occurs due to tin mining activities on Bangka Island has an impact on various aspects including fishermen who do not get catch fish because of dirty catching areas, beaches used as tourist objects to be polluted, clean water is getting scarce, plantation owners are disadvantaged because plantation land has changed into small pits under ex-mining quarries [8]. It also causes loss of soil fertility and function, making it difficult to re-use as plantation land. According to ex-mining land causes loss of soil fertility, so that only certain plant species can grow such as herbs and shrubs and require a long time to be able to increase soil fertility, add micro material, and improve the quality of soil micro-conditions [9].

The problem of environmental damage due to tin mining on the island of Bangka is still rarely raised and is associated with learning, especially learning science in junior high school on the island of Bangka and other junior high schools that have the same conditions. This causes not yet the emergence of an awareness of environmental damage due to tin mining that is around students. Environmental problems raised by teachers in learning are usually in the form of pollution or environmental damage that is still common. Teachers still rarely raise environmental problems that are indeed close to students, because the books provided by schools and the government are still general for all schools in Indonesia [10]. Recently, the teacher set up environmental damage of tin mining in Bangka through science instruction just briefly linking this problem as an example in learning. However, students' textbooks have not been shown or linked to environmental damage due to tin mining. The science teaching materials used by teachers are mostly textbooks or textbooks obtained from publishers [11]. So that the contents of the book are still very general and do not describe the area where the students are located.

In the Ikhsan research stated that by using learning based on environmental problems can increase creativity, knowledge, benefits, and critical thinking of students [12]. Module teaching materials based on environmental problems due to tin mining on Bangka Island are an innovation in terms of natural science teaching materials, so this study article aims to determine the teacher's need for problem-based learning module teaching materials for students who take the theme of pollution and environmental damage due to tin mining in Bangka Belitung. The analysis of the need for module teaching materials is related to three aspects namely, aspects of the learning model, aspects of module teaching materials, and aspects of the need for a problem-based IPA module due to a tin mine on Bangka Island.

2. Research method

This research uses a descriptive method. The questionnaire research instrument was filled by 10 science teachers who were teaching grades VII and VIII of SMP in Bangka Belitung. The technique of selecting teachers as subjects in this study is to use purposive sampling with the consideration of selected teachers are teachers who teach in junior high schools near tin mining activities on Bangka Island. The questionnaire is a closed questionnaire with the Guttman scale yes or no and in some questions accompanied by an open questionnaire to find out why the teacher answers the questions.

The object of this study is the need for teachers and students for teaching materials in the form of learning modules based on the problem of environmental damage due to tin mining on Bangka Island

in learning. Data analysis techniques by collecting data that has been obtained then analyzed using qualitative analysis methods with a narrative study of research results. The analysis includes the parts listed on each indicator in aspects, then redefined to be concluded about the teacher's need for module teaching materials and used in learning.

3. Result and Discussion

Based on a questionnaire that has been given to junior high school science teachers in Bangka Belitung, the analysis results for each aspect measured are presented in the histogram in figures 1, 2, and 3.

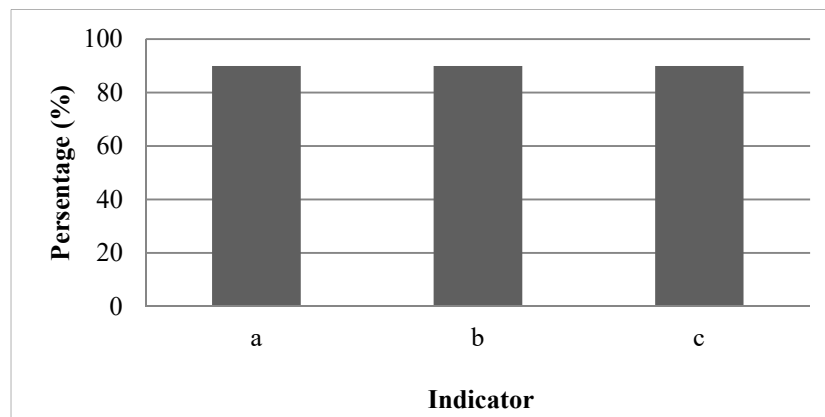


Figure 1. Results of an analysis of aspects of the learning model aspects.

The diagram above is the result of the analysis on aspects of the model in learning. In this aspect consists of 3 indicators the use of student center learning methods, PBL learning models, and environmental problems in the student's residence are related in learning. The average results obtained in this aspect are 90%.

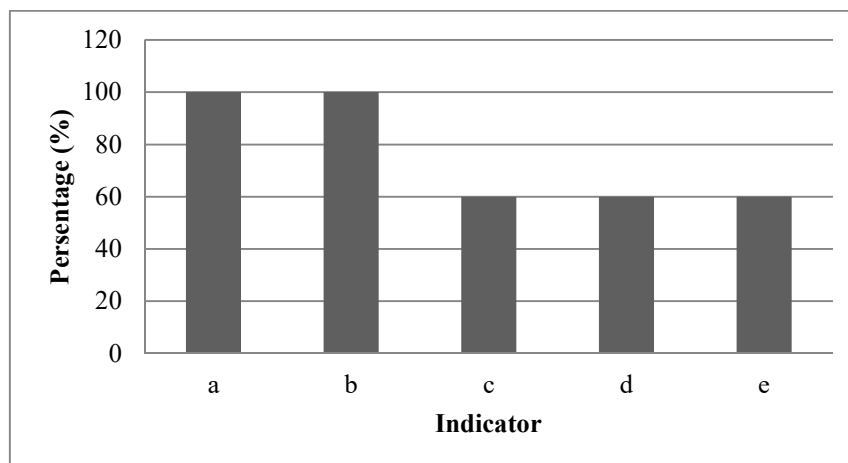


Figure 2. Results of an analysis of the module's teaching material aspects.

The diagram above is the result of an analysis of the module's teaching material aspects. In this aspect there are 5 indicators, namely the use of teaching materials in learning, the importance of teaching materials in learning, use of teaching materials in learning modules, use PBL modules in learning, the contents of the module are related to environmental issues around students. The average results obtained in this aspect are 76%.

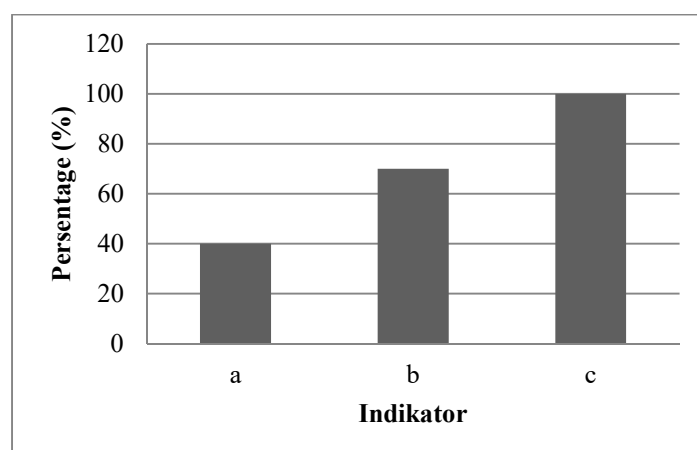


Figure 3. The result of an analysis of the need for a problem-based IPA module due to a tin mine on Bangka Island aspects.

The diagram above illustrates the results of an analysis of the aspects of the need for teaching materials for science module based on environmental problems due to tin mining on Bangka Island. In this aspect consists of 3 indicators with the result of the analysis namely 40% the Natural Sciences module is used in learning related to environmental problems due to tin mining on Bangka Island, 65% these problems due to tin mining on the island of Bangka in the matter of environmental pollution in learning, dan 100% the need for science modules is based on the problem of environmental pollution due to tin mining on Bangka Island. The average results obtained in this aspect are 70%.

Based on the results of the analysis of the 3 aspects above, it appears that the first aspect is the aspect of the learning model used by teachers in the learning process that 90% of teachers have used the student-centered learning method with PBL learning models. In learning with a student-centered approach to the PBL learning model, students are faced from the beginning with a problem and then followed by a student-centered information search process where the teacher is only as a guide so that it is expected to encourage students to be actively involved in building knowledge, attitudes, and skills [13] [3]. 90% of teachers have also linked learning with material on environmental pollution with environmental problems in the homes of students. Whereas, 10% the teacher has not used the student-center method with the PBL model and has not linked environmental pollution material to the environment of the students. So, the teacher still explained the general environmental pollution material. Besides, it is also because in the book that the teacher uses as a guide in learning is not yet based on PBL or is associated with environmental problems that are close to the student.

In the aspect of module teaching materials, all teachers have used teaching materials in learning. Teaching material is a set of material that is relevant and systematically arranged covering knowledge, skills and or attitudes used in the learning process to achieve core competencies and basic competencies [14]. Teaching materials used in environmental pollution materials vary, including printed teaching materials, 2013 curriculum science books, and student worksheets. The use of modules in learning is only used by 60% of teachers with the contents of modules that are PBL based and are associated with environmental problems around students. The teacher also states that teaching materials are very important to be used in the learning process. This is because the teaching material is a support and guide for teachers and students in an effective and efficient learning process, makes it easier for students to understand the material, and so that learning is more directed. The importance of using environment-based modules in learning is also consistent with research by Andi, which states that the use of environment-based modules is effective in improving student learning outcomes [15] [16]. Therefore, we need an environment-based PBL module around the students. Not all teachers use the PBL module based on the environment around students. 40% of teachers have not used modules based learning related to students' environmental problems. The teacher uses student textbooks or handbooks and

student worksheets in learning on environmental pollution material. So that students become unfamiliar and understand the environmental problems that are around them because they are still presented with environmental problems that are still common.

In the aspect of the need for natural science modules based on environmental problems due to tin mining on Bangka Island where 40% of teachers stated that the modules used in learning had listed environmental problems due to tin mining on Bangka Island. Meanwhile, 60% the teacher stated that the available modules did not present the problem of saving the environment due to tin mining in Island of Bangka. 70% stated that they had linked the environmental problems due to tin mining on Bangka Island in learning environmental pollution material, and 100% of teachers stated that teaching materials needed in the form of science modules based on environmental problems due to tin mining on Bangka Island on environmental pollution materials. According to the teacher, the need for a science module based on the environmental problems of tin mining on Bangka Island is because it is easy for students to achieve the competencies expected. In addition, because schools and the environment of students who are close to tin mining activities can be one of the potential to be used as a source of learning in learning process. Through this module can also introduce and emphasize early on to students to be able to prevent environmental pollution. Therefore, it is necessary to develop teaching materials for natural science modules based on environmental problems in the form of tin mining activities on Bangka Island. So, that teaching materials can be used in learning schools in Bangka and other schools with the same conditions on environmental pollution material.

4. Conclusion

Based on the results of data analysis from the three aspects above, it is concluded that the science module teaching materials are needed which include environmental problems caused by tin mining on Bangka Island. This is important considering the teaching materials used by teachers in learning have not discussed environmental problems around the student's residence, one of which is environmental problems due to tin mining on the island of Bangka. This module can be used in the learning process of students on Bangka Belitung Island and other schools with the condition of schools or residences close to mining activities, especially in mining.

References

- [1] Setyowati R, Parmin and Widiyatmoko A 2013 *Unnes Science Educational J.* **2** p 245-53
- [2] Wenno I H 2010 *J. Cakrawala Pendidikan* **2** 177-83 <https://doi.org/10.21831/cp.v2i2.338>
- [3] Mergendoller J R, Maxwell N L and Bellisimo Y 2006 *Interdisciplinary J. of Problem-Based Learning* **1** 49-69 <https://dx.doi.org/10.7771/1541-5015.1026>
- [4] Ferreira M M 2012 *J. Of Classroom Interaction* **47** 23-30
- [5] Hakkarainen P 2007 *J. Technology Research and Development* **57** 211-28
- [6] Moutinho S, Joana T, Isabel F and Clara V 2015 *Proc. World Conf. on Educational Science (Istambul)* vol 191 (Amsterdam: Elsevier) p 1871-5
<https://doi.org/10.1016/j.sbspro.2015.04.324>
- [7] Akinoglu O and Tandogan R O 2007 *Eurasia J. of Mathematics, Science, and Technology Education* **3** 71-81 <https://doi.org/10.12973/ejmste/75375>
- [8] Indra C A 2014 *J. Society* **2** 26-34
- [9] Nurtjahya E D, Setiadi E, Guhardja and Y Setiadi 2009 *Blumea Research Article* **54** 131-8
<http://doi.org/10.3767/000651909X475491>
- [10] Tivani I and Paidi 2016 *J. Inovasi Pendidikan IPA* **2** 35-45
<http://dx.doi.org/10.21831/jipi.v2i1.8804>
- [11] Yuliaty L 2013 *J. Pendidikan Fisika Indonesia* **9** 53-7
- [12] Ikhsan F A, Kurnianto F A, Apriyanto B, Nurdin E A and Puji R P N 2019 *International Conf. on Environmental Geography and Geography Education (Jember)* vol 243 (United Kingdom/IOP Publishing) p 1-10
- [13] Prasetyawati P 2016 *E Jurnal Katalogis* **4** 130-7

- [14] Susilowati S 2017 *J. Inovasi Pendidikan IPA* **3** 78-88 <http://dx.doi.org/10.21831/jipi.v3i1.13677>
- [15] Badawi A I and Muhammad Q 2015 *J. Pendidikan Fisika* **3** 110-4
- [16] Aditia M T and Muspiroh N 2013 *J. Scientiae Educatia* **2** 1-20