

THE EFFECTIVENESS OF TEACHING MATERIALS TO INCREASE SCIENCE LITERATION IN THE MATERIALS OF VISION AND OPTICAL TOOLS

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Abstract

The aim of this research is to describe the feasibility of the effectiveness of teaching materials to improve the material science literacy of the Sense of Vision and Optical Instruments class VIII. The research method uses Research and Development (R & D). The results of the study showed that the results of the analysis of the increase in ability in each dimension of scientific literacy experienced a significant increase. In the dimensions of the science context the increase obtained is equal to. In the dimensions of scientific content the increase obtained is as big as and in the dimensions of the saims process the increase obtained is equal to.

Keywords: *Scientific literacy, teaching materials.*

INTRODUCTION

Science learning at junior high school level has applied the existence of scientific literacy skills to students. According to Djuniar, et al (2013) suggested that science learning would be more meaningful if students had scientific literacy. Someone who use science concepts and have the ability of science processes to be able to judge in making everyday decisions that relate well to other people, the environment, the interaction of science, technology and society including social and economic development (Toharuddin, 2011).

According to PISA, science literacy (2015) is interpreted as "the ability to deal with science-related issues and the ideas of science, as a reflective citizen". Literacy is defined as the ability to engage with issues related to science and with ideas of science as reflective humans. Scientific literacy is multidimensional, so not just an understanding of scientific literacy, but more than that. The assessment of scientific literacy in PISA is not merely a measure of the level of understanding of science knowledge, but also an understanding of various aspects of the science process, as well as the ability to apply scientific knowledge and processes in real situations faced by students, both as individuals, community members, and citizens world (PISA, 2015).

Based on a report from the Economic Cooperation and Development Organization (OECD) in 2015, the results of the Indonesian PISA test ranked 69th out of 76 participating countries. The

measurement of literacy though has increased but is still low compared to the average OECD. Thus, the literacy abilities of Indonesian students are inadequate

Tests of scientific literacy skills given to 32 students of class VIII J Cerme Middle School 1 also showed the level of scientific literacy skills was not maximal. Based on the results of tests of scientific literacy skills that have been carried out the acquisition of aspects of scientific content by 46.87%, while the achievement of aspects of the science context is 28.12%, and the achievement of the process aspects of science is 37.50%.

The content of scientific literacy itself has been apparent in the student's book but is still less balanced between each aspect of scientific literacy. According to Endah (2016) the content of scientific literacy in class VIII science students' books on the material of the Sense of Vision and Optical Instruments consists of four categories namely science knowledge, inquiry as the nature of science, science as a way of thinking, and interaction of science, technology and society. 40% of the student book contains science knowledge, 27% contains an investigation of the nature of science, 27.4% contains science as a way of thinking, and as much as 5.2% of student books contain interactions between science, technology and society. Based on these data, it can be seen that the scientific literacy category that dominates the books of class VIII students on the material of the Sense of Vision and Optical Instruments is the category of science knowledge.

According to Endah (2016), if the composition of the presentation of the science content category is too large, it is feared that it will affect the student learning system or classroom learning. Science learning will lead more to mastery of science content than to the science process by developing their own ways of thinking and scientific inquiry from the students themselves. When the science process of students is low, it is possible for students to have difficulty in placing science in real life, so that the ability to understand the interaction of science, technology, and society will not develop optimally.

The low level of scientific literacy in students can be influenced by learning processes that are not attractive to students. This means that the learning process has a big influence on the level of scientific literacy skills. Interesting learning can be created through several elements, one of which is learning resources.

One learning resource is teaching material. Teaching materials are materials or learning materials that are systematically arranged which are used by teachers and students in Teaching and Learning Activities. This teaching material was developed to support learning so students can easily understand the material and can improve scientific literacy.

METHOD

The type of research applied in this research is research and development development research (R & D). The objectives used in the research are Indera Sight and Optical Instruments teaching materials aimed at 27 students of class VIII J Cerme Middle School 1. The instruments used were the pretest and posttest sheets. student scientific literacy: Data collection techniques in the form of tests, while to find out the increase in scientific literacy tests, the data analysis technique used is the analysis of N-Gain with the following equation:

$$g = \frac{S_f - S_i}{S_{maks} - S_i}$$

Then the results of the n-gain calculation, the score obtained is converted by adjusting to the following criteria:

Table 1. Normalized N-Gain Criteria

N-Gain	Criteria
$0,00 < (g) \leq 0,30$	Low
$0,30 < (g) \leq 0,70$	Medium
$0,70 < (g) \leq 1,00$	High

RESULTS AND DISCUSSION

The results of the research are presented in the following table:

Table 2. Recapitulation of Science Literacy Test Results

No	Pretest	Posttest	N-Gain	Criteria
1	19	78	0,73	High
2	24	63	0,51	Medium
3	19	84	0,80	High
4	24	96	0,95	High
5	19	84	0,80	High
6	24	100	1	High
7	24	87	0,83	High
8	19	79	0,74	High
9	24	82	0,76	High
10	24	96	0,95	High
11	24	96	0,95	High
12	29	96	0,94	High
13	43	88	0,79	High
14	24	88	0,84	High
15	34	90	0,85	High
16	24	92	0,89	High
17	15	36	0,25	Low
18	15	96	0,95	High
19	15	80	0,76	High
20	29	92	0,89	High
21	24	84	0,79	High
22	19	74	0,68	Medium
23	19	71	0,64	Medium
24	19	74	0,68	Medium
25	24	79	0,72	High
26	19	78	0,73	High
27	18	88	0,85	High
Rata-rata	22,74	83,37	0,79	High

Based on table 2, it can be seen that each result of the pretest and posttest given to students gets different values. Judging from the overall pretest average results obtained an average of 22.74 while the average for the overall posttest was 83.87. From the results of the pretest and posttest it can be seen that there is a large increase in n-gain. The average n-gain obtained as a whole is 0.79 with a high category.

The high achievement of n-gain indicates that the instructional materials developed are effective to use. As according to Hake who stated that the developed teaching material was declared effective if the gain of the normalized score > 0.3 . But the size of each student's score is different. This is because the results of the students pretest and posttest are also different.

Table 3. Percentage of N-Gain Criteria

Percentage (%)	The number of Student	Criteria
81,48	22	High

Percentage (%)	The number of Student	Criteria
14,81	4	Medium
3,70	1	Low

Based on table 3, it can be seen that as many as 22 students achieved an increase with high criteria with a percentage of 81.48%, 4 students achieved an increase with medium criteria with a percentage of 14.81%, and 1 student achieved an increase in low criteria with a percentage of 3,70%.

The low percentage of students who get n-gain is low because students pay less attention when learning takes place. In addition, the differences in literacy test results are caused by internal factors. Internal factors are factors that arise from students. These internal factors can be in the form of lack of interest and motivation in learning, difficulty managing study time, and lack of health care so that it disrupts the learning process (Guswita, 2014). This is in accordance with the statement of Yusuf (2011) which states that student and family characteristics, reading habits, learning motivation, interests, and self-concepts, and strategies can influence variations in scientific literacy scores.

Table 4. Percentage of Average Dimensions of Science Literacy

Dimensions	Percentage of average pretest (%)	Percentage of average posttest (%)	Large Increase (%)
Science contxt	20,78	81,22	60,43
Science conten	21,23	83,46	62,23
Science process	22,20	80,25	58,04

Increasing scientific literacy in the dimensions of the science context has experienced a significant increase. This shows that teaching materials developed are able to improve students' scientific literacy. Phenomena, issues, and problems displayed in teaching materials are directly related to the concept of material studied by students. This is in accordance with the statement from Gilbert (2011) which states that using context as a direct application of the concepts learned by students can facilitate students in understanding the concepts learned.

Increasing scientific literacy in the dimensions of science content also experienced a significant increase. This shows that teaching materials developed can improve students' scientific literacy. One factor that increases the dimensions of this content is the

feature of science content in teaching materials developed in languages that are easily understood and adapted to junior high school students, and the addition of images and tables to facilitate students' understanding. This is consistent with Mayer's statement that the use of a combination of text, images and tables in teaching materials can facilitate students in understanding the content being learned.

The science process has also increased. This shows that students are motivated by the experiments conducted, Hariadi (2009) argues that the large increase in students' literacy skills is proportional to the students' interest and motivation to learn. However, this science process is also the lowest percentage increase. This is due to lack of available tools so that the implementation of the science process when conducting experiments becomes less than optimal.

Conclusion

Based on data analysis and discussion it can be concluded that there is a significant increase in scientific literacy skills in each dimension of scientific literacy. In addition, the results of the analysis of n-gain student literacy skills indicate that most students belong to the high category.

Suggestion

Suggestions that can be given by researchers are teaching materials that have been developed that can be applied in schools by Science Teachers to improve scientific literacy.

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