

RESEARCH ARTICLE

EFFECTIVENESS OF SCIENCE TEXTBOOKS BASED ON SOCIO-SCIENTIFIC ISSUES IN GLOBAL WARMING MATERIALS TO IMPROVE LEARNING OUTCOMES

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anuscript Info Abstract

Manuscript Info Manuscript History Efforts to overcome the impact of global warming are integrating Received: 15 September 2022 science learning with socio-scientific issues approach. Integration that Final Accepted: 19 October 2022 can be done is by developing a textbook based on socio-scientific Published: November 2022 issues on global warming material. This may be because the existing books do not highlight the current issue of global warming. This study Key words:aims to determine the effectiveness of textbooks based on socio-Science Textbooks, Learning Outcomes, scientific issues to improve student learning outcomes. The research Socio-Scientific Issues, Global Warming sample used was 32 students from 7th gradeIslamic Junior High School. This research used a one group pretest-posttest design which the final result was an n-gain value. The results of the n-gain analysis will represent the effectiveness of science textbooks based on Socio-

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Scientific issues in global warming material to improve student

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learning outcomes.

Introduction:-

The development of the 21st century is marked by the flow of globalization in the fields of technology, industry and education. Science learning which is oriented to the development of thinking skills, students must have a good understanding of concepts so that student learning outcomes are more optimal. Learning outcomes are defined as competencies or abilities, both knowledge, attitudes, and skills that must be achieved by students after going through the learning process (Kunandar, 2014). Student learning outcomes in the knowledge aspect follow Bloom's taxonomy which was revised by Anderson et.al.(Krathwohl, 2002). The knowledge aspect is a combination of the knowledge dimensions (factual, conceptual, procedural and metacognitive) with the cognitive process dimensions starting from remember, understand, apply, analyze, evaluate, and create.

One way to improve student learning outcomes is to use appropriate learning media such as textbooks. Textbooks are guidebooks for students in learning activities that contain material, investigation activities and examples of the application of science in life (Trianto, 2011). Books are still the main source that is widely used by teachers and students (Tania et.al., 2015). One of the learning approaches that can connect subject matter with issues that exist in society is the integration of *Socio-Scientific Issues* (SSI) into textbooks.

Socio-scientific issues are complex and controversial social issues related to the ideas and principles of science (Sadler et.al., 2017). The integration of the *Socio-Scientific Issues* (SSI) approach in textbooks can support students in developing knowledge competencies, especially analyzing controversial dilemmas to construct their own knowledge. Learning science based on socio-scientific issues can have a positive impact on students' conceptual

Corresponding Author:- Annisa Maya Kurnianingrum Address:- Department of Science Education Magister, University of Jember, Jember, Indonesia 68121. understanding (Herman, 2019). One of the science materials that is closely related to scientific issues that are still often debated is global warming.

The Intergovernmental Panel on Climate Change (IPCC, 2013) states that global warming is unavoidable and the main cause is human activity. Global warming affects human health, social and economic life of individuals and societies. It is very important for students to understand the causes and effects of global warming in preparation for climate change. Therefore, global warming is one of the materials that must be mastered by students at the elementary education level, namely in 7th grade (Kemendikbud, 2016). However, research conducted by Damayanti et.al. (2017) showed that students' knowledge about global warmingstill low. The results of the preliminary study through a questionnaire showed that 33 out of 64 students were still confused about the difference between global warming and climate change. In addition, students still have difficulty relating the material to issues that develop in society. Therefore, it is necessary to develop science textbooks that can increase students' knowledge about global warming.

Research Method:-

Data collection is in the form of a written test called pretest and posttest. The reasearch design uses a one group pretest-posttest design (Sugiyono, 2011)by using a selected sample group of 32 students and given treatment in the form of a pre-test at the beginning (O₁), followed by the treatment (X) and at the end of the lesson is given a posttest (O_2) . The research design that being used can be described as follows $O_1 - \cdots - X - \cdots - O_2$

Information:

- O₁ : Pre-test (before treatment)
- Х : Treatment using science textbook
- O₂ : Post-test (after treatment)

The aims of *pre-test* and *post-test* was to determine the increase in student learning outcomes after using textbooks based on Socio-Scientific Issues on global warming material. The test instrument is in the form of an essay test consisting of 3 questions on the cause of global warming, 3 questions on the impact of global warming, and 3 questions on efforts to tackle global warming to measure students' cognitive learning outcomes. The learning outcomes test measures the dimensions of students' knowledge at the level of understand, apply, analyze which are the characteristics of higher order thinking. Learning outcomes data were analyzed using the Normalized gain or Ngain (Hake, 1998) as follows

 $N - gain = \frac{posttest \ score - pretest \ score}{maximum \ score - pretest \ score} \times 100\%$

The result from N-gainanalysis then described according to the criteria as shown in Table 1 bellow

Table	1:-	Criteria	for	N-gain.
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Score Range	Criteria
$g \ge 0.7$	High
$0.3 \le g \le 0.7$	Medium
g < 0.3	Low

In addition to looking for N-gain, student learning outcomes in the knowledge aspect can be analyzed using the following equation (Purwanto, 2008)

$$NP = \frac{R}{SM} \times 100\%$$

Information:

NP : percent value sought

- : the value obtained by the student R
- *SM* : the maximum value of the test

The data of student learning outcomes then categorized according to the criteria (Purwanto, 2008) in Table 2 below.

Table 2 Chieffa for student learning outcomes.	
Score	Criteria
85 % < NP 100%	Very Good
75% < NP 85%	Good
59% < NP 75%	Enough
54% < NP 59%	Less
NP 54%	Less Once

Table 2:- Criteria for student learning outcomes.

Results and Discussion:-

Effectiveness of science textbooks based on socio-scientific issues was obtained from the N-gain results of pre-test and post-test. The pre-test and post-test aims to determine students' understanding of the knowledge aspect of global warming material when learning is integrated with the use of science textbooks based on socio-scientific issues. Questions on the pre-test and post-test in the form of an essay test consisting of 3 questions at each meeting. The results of the measurement of student learning outcomes from the pre-test and post-test are illustrated in table 3 below.

Test Result	Meeting	Criteria	Total students	N-Gain average	
Learning Outcomes	I	High	5	0,79	
-		Medium	27	0,44	
		Low	-	-	
	Π	High	5	0,78	
		Medium	24	0,44	
		Low	3	0,29	
	III	High	5	0,81	
		Medium	27	0,47	
		Low	-	-	
Average N-Gain Overall				0,57	

Table 3:- Results of Gain Score Analysis of Learning Outcomes.

The results of the N-*gain* of learning outcomes at the first meeting show that as many as 5 students obtained an average gain score of 0.79, which is classified as high criteria. In addition, 27 students obtained an average gain score of 0.44 which is classified as medium criteria. At the second meeting, as many as 5 students obtained an average gain score of 0.78, which is classified as high criteria, and 24 students obtained an average gain score of 0.44, which which is classified as medium criteria and 3 students obtained an average gain score of 0.29, which is classified as low criteria. At the third meeting, as many as 5 students obtained an average gain score of 0.81, which is classified as high criteria, and 27 students obtained an average gain score of 0.47, which is classified as medium criteria. Overall from the three meetings, the average gain score of 0.47, which is classified as medium criteria. This shows that science textbooks based on scocio-scientific issues in global warming material are quite effective in improving student learning outcomes.

The results of pre-test and post-test learning outcomes can be categorized according to the level of student learning outcomes as follows.

Score	Criteria	1 st meeting		2 nd meeting		3 rd meeting	
		Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
85% < NP ≤ 100%	Very	0	1	0	2	0	2
	Good						
$75\% < NP \le 85\%$	Good	0	3	0	3	0	2
$59\% < NP \le 75\%$	Enough	0	5	1	10	0	5
$54\% < NP \le 59\%$	Poor	0	8	0	10	0	16
$NP \le 54\%$	Very Poor	32	15	31	7	32	7

Table 4:- Level of Student's Learning Outcomes.

Table 4 shows that the level of learning outcomes obtained during the pre-test by more than 30 students was classified as very poor criteria, but during the post-test the level of learning outcomes of some students increased to the criteria of poor, enough, good, even very good. At the first meeting, many students had very poor learning

outcomes. However, at the second and third meetings, student learning outcomes have increased, this happens because students have adapted to learning by using science textbooks based on socio-scientific issues and students are more active when learning takes place. In line with research conducted by Ilfiana et. al. (2021), using scoio-scientific issues during the learning with issues which is happen close to students' daily life can motivate student to make meaningful learning. In addition, learning outcomes are also influenced by intrinsic factors (from within student) and external factors (from outside). Intrinsic factors is related to motivation to learn and prior knowledge possessed by students, while extrinsic factors is related to facilities at school.

The lack of prior knowledge of students related to global warming makes it difficult for students when learning takes place because many terms are not yet known. This causes students' ability to answer the test questions of learning outcomes is still low. The use of science textbooks based on socio-scientific issues at the first meeting made students understand more about global warming, so that at the second and third meetings, the level of student learning outcomes was classified as enough. Based on these results, science textbooks based on socio-scientific issues have proven to be effective enough in improving students' learning outcomes.

Conclusion:-

Science textbooks based on socio-scientific issues in global warming materials is effective enough for improving learning outcomes of Islamic Junior High School students. The results shows difference in the mean of the pretestand post-testresults, and the N-gain value is 0,57 with medium criteria. Learning outcomes student in Islamic Junior High Schoolon global warming materials after using science textbooks based on socio-scientific issues was classified as good enough

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