Development of Module Based on Scientific Contextual Additives Material to Increase Learning Outcomes and Science Process Skills in Junior High School

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Abstract

This study aims to increase learning outcomes and science process skills of students using modules based on scientific contextual. This is a type of research and development (R&D) with the development procedure of Sugiyono's model with the pre-experimental design method with the form of one group pretest posttest design. Increased student learning outcomes and science process skills is explored through the observation sheet, then analyzed using N-gain. The results showed that modules based on scientific contextual could increase student learning outcomes with N-gains of 0.481 (medium) in class VIII 6 and 0.446 (medium) in class VIII 7. Science process skills of students experienced an increase in each aspect namely observing, classification, interpreting, and communication with N-gain acquisition amounting to 0.08 (low); 0.05 (low); 0.25 (low); and 0.07 (low) for class VIII 6, while science process skills in class VIII 7 experienced an increase in each aspect with N-gain acquisition equal to 0.3 (medium); 0.3 (medium); 0.5 (medium); and 0.5 (medium). Based on the results of the analysis, it can be concluded that the development of modules based on scientific contextual effectively increasing student learning outcomes and science process skills.

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INTRODUCTION

The Indonesian government has made many changes to the education system, especially in the curriculum structure and learning patterns to improve the quality of education. In fact, the 2010-2014 education system in Indonesia did not go well. This can be seen from the results of a survey conducted by Education For All (EFA) that there was a decline in the education system, in which Indonesia was ranked 65 out of 128 countries in 2010 with an education development index of 0.947 and in 2011 Indonesia's ranking dropped to 69 127 countries surveyed with an educational development index value of 0.934 (EFA, 2011).

The results of the OECD research show that Indonesia has a scientific capacity of 60 with a value of 383 (OECD, 2012). This means that education in Indonesia has decreased especially in science learning. According to Suastra (2009), the nature of science has three components, namely the product component, process, and attitude. The essence of the nature of science is how students are able to behave and show their character. In fact, science learning is not taught in accordance with the nature that is owned, but rather how to transfer knowledge. This is what causes the gap in science education, so the desired results are not as expected. The results of learning science are unsatisfactory and even tend to decline, so that the level of human resources decreases.

West (2010) explains that ideally science learning must make students free to think, work, and find ways to solve educational problems without being burdened with understanding constraints. Rahayu et al. (2012) to change barriers to understanding, teachers are required to present learning that is designed to be meaningful, fun, and easily understood learning, so as to improve student learning outcomes. Accuracy in using the teaching method carried out by the teacher will be able to arouse students' motivation and interest in the subjects given as well as the process and student learning outcomes (Hartono et al., 2015).

Biology is a part of science that consists of products and processes. Biology as a product consists of concepts, facts, theories, and laws relating to living things, while biology as a process consists of groups of process skills including observing, making questions, using tools, classifying or grouping, applying concepts and conducting experiments. Biology learning must basically be able to equip students how to know concepts, facts in depth, and must be able to provide intellectual satisfaction, especially in building thinking skills, because this thinking ability will have implications for knowledge (cognitive), attitudes (affective), and skills (psychomotor). The three components are outputs or results that must be obtained after studying biological science, which is called learning outcomes.

The results of observations made at SMP (Junior High School) Negeri 1 Slawi indicate that to solve a problem, most students still depend on guidance and direction from the teacher. This takes up the time of learning activities and students increasingly depend on the teacher, even though students are required to be independent, trained and can develop thinking skills in understanding the subject matter. To realize effective learning, teachers play an important role in learning. Teachers must be able to guide, direct and create student learning conditions (Khoirunisyah et al., 2016). Duruk (2017) teachers are allowed to take the initiative as active process practitioners. The teacher must be able to make a flexible plan and the results are in accordance with the learning plan.

Matamoros (2014) argues that learning resources in the form of appropriate books can help teachers in preparing lesson plans and are able to develop students' abilities in understanding concepts. However, the majority of books available are only books that are abstract material and do not pay attention to the side of the book. Surahmadi (2016) argues that students are bored if the material is only memorized and listens to the teacher's explanation. The book that students like is to load simple and not many contents that are

discussed, concrete and related to daily life, not many scientific terms and easily memorized (Hindarto et al., 2017). Research conducted by Hayati (2013) shows that students like the presence of innovation in learning that prioritizes student activity and direct involvement with experience.

Janbuala (2013) states that scientific learning can improve students' science process skills, because in scientific learning there are elements of scientific methods and inquiry where students do their own learning activities, and in groups conduct investigations, experiments, make decisions, conclude, and communicate what is obtained from his learning experience so that students obtain optimal psychomotor abilities. Dimopoulos (2009) research proves that the use of modules is able to accommodate students 'abilities and positively influence students' cognitive and affective abilities. Modules are able to accommodate students' abilities by utilizing learning time to be more efficient so that educational goals are achieved. Cooper & Hanmer (2006) state that: 1) the module makes students better understand a concept that must be investigated and analyzed in the classroom so that the teacher can identify students' difficulties and understanding, 2) the module can facilitate interaction between students and encourage the formation of cooperation both in small groups, 3) learning activities become more fun. The results of this study also reveal the weaknesses of the module which is not effective if applied in large classes, because it requires a long time in the learning process.

Donelly & Fiztmaurice (2006) stated that in module design for learning must pay attention to the logical relationship between the needs in the teaching and learning process, learning objectives, learning outcomes to be achieved, learning resources, learning strategies, learning and evaluation criteria. Rosa (2015) shows that the module is very helpful for students to learn independently, modules that are equipped with simple experiments help and are needed by students as study guides. Modules are a printed teaching material for curriculum packages that

are provided to be able to be used by self-learning students, so that without the presence of teachers students can learn independently. The development of the module aims to enable students to determine the speed and intensity of their own learning (Izzati et al., 2013). Modules make students learn more systematically (Wibowo et al., 2015). The purpose of this study is to increase learning outcomes and science process skills of students using modules based on scientific contextual material additives.

METHODS

This is a type of research and development (R&D) with the development procedure of Sugiyono's model with the pre-experimental design method with the form of one group pretest posttest design. The subjects in this study were eighth grade students of SMPNegeri 1 Slawi. The number of population subjects is 8 classes. Two classes were used as classes for research, each consisting of 23 students. Samples in the study that have been grouped into two groups are given the same treatment, given science learning using scientific contextual based modules. The results are obtained by comparing the conditions before and after the learning treatment.

The variable of this research is scientific contextual learning based modules on additive matter. The dependent variable is students' science process skills which include observing, clarifying, interpreting and communicating. The data collected in the study included: data on module additives material in class VIII of SMPNegeri 1 Slawi which was used as a needs analysis, data module validity based on scientific contextual material additives by education experts and material, data readability of modules and worksheets, and learning outcomes, science process skills. Data collection techniques used were documentation, evaluation tests, questionnaires, and observation sheets. Data analysis in this study includes qualitative descriptive analysis of the characteristics of learning devices, descriptive percentages about validity and completeness of learning science

process skills, quantitative descriptive analysis of the readability of activity books and worksheets and N-gain test for analysis of increasing learning outcomes, science process skills.

RESULTS AND DISCUSSION

The results of module validation based on scientific contextuals on additive material and other learning devices can be seen in Table 1.

Table 1. Results of Teaching Materials Validation

Validator	Percentage of Validity (%)			
	Module	Syllabus	LKK	RPP
Validator 1	86,09	90,77	90,00	92,00
Validator 2	93,91	96,92	96,67	91,00
Validator 3	85,22	95,38	78,33	92,00
Mean	88,41	94,35	88,33	92,00
Criteria	Very Valid	Very Valid	Very Valid	Very Valid

Learning with scientific contest-based learning modules gives flexibility to students to make their own understanding of the material in solving problems with the guidance of teachers, find their own concepts from the results of understanding the material, so motivate and encourage students to actively explore their own knowledge to become active, critical in solve problems, and be independent. Students not only learn theory, but directly practice the concepts learned so that students feel that science is not only studied, but also applied in daily life (Hunde & Tegegne, 2010).

The results of the recapitulation of the practicality of the module based on scientific context in the material of additives can be seen in Table 2.

Table 2. Recapitulation of Questionnaire Practicality on small scale trials

Nomor	Principal statement	Respon (%)	
		Ya	Tidak
1	Ease of use	100	0
2	Suitability allocation processing time LKS / LDS	100	0
3	Suitability allocation of time working on evaluation questions	44	56
4	The criteria / rubric of the LKS / LDS instrument and the evaluation questions provided make it difficult	100	0
5	Compatibility of module writing procedures	100	0
6	Suitability of word	75	25
7	Suitability of language use	63	37
8	Suitability of LKS / LDS and evaluation questions in reviewing learning	100	0
9	Makes it easier to see indicators	63	37
10	Measure how far the competency has been possessed	100	0
11	Can diagnose learning poetry	100	0
12	Provide encouragement for independence in learning	100	0
MEAN		87	13

The average positive response to the scientific contextual learning module is 87% and the negative response is 13%, so the learning module is declared practical. This practical

learning module was corrected in a certain section based on the results of the practicality questionnaire which was assessed as still having a negative response, such as the allocation of work time questions, language usage, and ease of achievement of indicators on LKS / LDS. Based on the results of the questionnaire, improvements were made to the module, LKS / LDS. Small-scale tests to determine students' responses to scientific context-based modules were given to 16 respondents who were class VIII students of SMP (Junior High School) Negeri Slawi 1 randomly. The average percentage score obtained on small-scale tests on module development was 87% with very practical criteria. Ahmadi et al. (2011) states that the device is said to be practical if it shows that what is developed can be applied and the reality shows that what they develop can be applied. From the results of small-scale trials, student readability questionnaires and teacher response questionnaires indicate that scientific context-based modules are appropriate to use. The module implementation data was taken from observations where the observations were carried out by one practitioner (colleague), namely the teacher at Slawi 1 Public High School. Learning activities are carried out in accordance with the RPP. Based on predetermined criteria, the module is included in the excellent category so that the learning device developed can be used later in a large-scale trial on additive learning.

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The module implementation data was taken from observations where the observations were carried out by one teacher at SMP Negeri 1 Slawi. Learning activities are carried out in accordance with the RPP. The results of observations made during the two meetings obtained a mean percentage on a large scale for each experimental class were 97.1% and 98.1%. Based on predetermined criteria, the module is included in the excellent category so that the learning device developed can be used later in a large-scale trial on additive learning.

Modules based on scientific contextual material additives are said to be effective if the two experimental classes experience increased learning outcomes as in Table 3.

Table 3. N-gain Test Results from Mean of Pretest and Posttest Values

Class	Mean of *Pretest*	Mean of *Posttest*	N-*gain* Scores	Category
VIII 6	64,78	81,74	0,481	medium
VIII 7	65,43	80,87	0,446	medium

Based on Table 3, it is known that the N-gain score in class VIII 6 is 0.481 (medium) and class VIII 7 is 0.446 (medium). This shows an increase in student learning outcomes after learning using modules based on scientific contextual material additives.

The effectiveness of the practical activity book is also proven by the number of students who have finished learning more than 85% of the KKM score 75, shown in Table 4.

Table 4. Results of Percentage Students Completeness

Experiment Class	Number of Students Complete	Percentage ofStudents Complete (%)	Number of Students Not Complete	Percentage of Students Not Complete (%)
ClassVIII 6	18	78,26	5	21,74
ClassVIII 7	17	73,96	6	26,08

Based on the results of the analysis it is known that the number of students who completed in class VIII 6 were 18 students, with a percentage of 78.26%. While for students who did not complete, there were 5 students with a percentage of 21.74%. The number of students who completed in class VIII 7 were 17 students with a percentage of 73.96%. While for students who did not complete numbered 6 students with a percentage of 26.08%. The results of student learning completeness analysis were determined based on the students' scores which were above the KKM limit of 75. The two experimental classes showed that the number of students who had complete grades in learning was greater than those who did not complete, the number exceeded half of all students, but the module scientific contextual based learning has not been effective in learning additive material because it has not reached the success indicator ≥ 85%.

The effectiveness of the scientific contextual learning module on additives is measured by analyzing student learning outcomes after using the module in learning. This is in accordance with the study of Purnomo et al. (2013) and Ningtiyas & Siswaya (2012) the application of the research results module has a positive effect on Biology learning outcomes Al Irsyad Middle School and students who have high activity get higher average scores in the class taught with the developed module. Learning outcomes are abilities possessed by students after receiving learning experiences (Sujana, 2005) in this study the intended learning outcomes are the results of cognitive tests. In accordance with Juhji (2016) getting direct learning experience during the learning process will make it easier for students to remember the knowledge gained.

Learning activities include exploration activities of environmental observations around Slawi 1 Public Middle School. Students make observations directly by observing objects to compare facts and theories. According to Clements (2004) outdoor learning provides an understanding of more concepts and trains children to be skilled. Skills that are trained in students include science process skills, communication, and responsibility. Modules contribute to the quality of student learning outcomes because they contain material structures that contain competencies to be achieved by students (Bauer, 2010). Written modules have many advantages, including in accordance with the psychology of students, have feedback, have more credibility, are relatively inexpensive, flexible, can act as a substitute for teachers (Lizt, 2005).

There are still some students who have not achieved learning mastery due to several possibilities including factors of attraction, motivation, and active involvement of students in learning which cause them to not be able to adapt to learning patterns that require them to be active and build their own knowledge so that understanding of the material delivered also low. The incompleteness of the learning module classically is caused by many factors, one of which comes from the printing of modules that are not good on mass products so that students' motivation for learning is less influential on learning outcomes.

Based on the data from the calculation of student observation values, it can be concluded that science process skills in the medium category. Student observation values at the beginning and end of learning in both

experimental classes and each N-gain scores in each aspect are presented in Table 5.

Table 5. Results Analysis of Student Science Process Skill

Aspect ofScience Process Skills	Experiment Class VIII 6			Experiment Class VIII 7		
	Pretest	Posttest	N-gain	Pretest	Posttest	N-gain
Observing	57	58	0,08	58	62	0,3
Classification	58	58,5	0,05	57	61	0,3
Interpreting	54,8	58,3	0,25	58	64	0,5
Communication	61,5	62	0,07	58	63	0,5

The application of scientific contextual learning in learning is able to provide more interesting learning alternatives. Learning activities using modules based on scientific contextual makes student activeness increase, so that it can help students understand the material being studied and can train students' science process skills. According to Sandra et al. (1990) science learning is not only learning concepts but must include other components such as science process skills. The aspects of science process skills observed in this study were observing, classifying, interpreting and communicating. Each indicator of science process skills that will be trained is contained in the student worksheet. In accordance with Anisa et al. (2014) which states the activity of students during the learning process takes place can improve science process skills.

Scientific contextual based learning will provide a learning experience that is more than a lecture learning method. Through this learning students can explore the science process skills they have, and can increase the spirit of learning so that they can improve students' cognitive abilities. This is supported by Bruner's theory known as the name of learning discovery. Knowledge gained by learning discovery has several advantages, one of the advantages of knowledge will last longer in students' memories because in learning students are directly involved. Besides learning discovery arouses curiosity of students so that it will become more active.

During the study, students were seen to be active in carrying out each stage of the learning activity because of the students' high curiosity. This is in accordance with the statement of Ambarsari (2013) that through the guided inquiry approach students in the learning process are increasingly active because students carry out observing activities, classify, predict, measure, conclude and communicate learning material. According to Yuniastuti (2013), learning with guided inquiry strategies is able to increase learning motivation and students' process skills in biology learning.

Huda et al. (2017) with the existence of peer tutors who are less active students become active, because they are no longer ashamed to ask questions and can express their opinions freely to their peer tutors. The emergence of more questions is also because students are involved in the process of integrating additive material which is a new thing that has never been seen before. In accordance with Salamah & Mursal (2017) that active students in applying concepts through new things in learning will raise questions. Another factor that supports the improvement of science process skills in each cycle is the quality of learning that is getting better with the application of learning modules. The better the quality of learning managed by teachers in the classroom, the greater the quality of students. Rahmasiwi et al. (2015) which states that improving the quality and implementation of the learning process results in the achievement of the score of each aspect being high.

Learning which based on scientific contextual will provide a better learning experience than lecture learning methods. Through this learning students can explore the science process skills they have, and can increase the spirit of learning so that they can increase students' cognitive abilities. This is supported by

Bruner's theory known as the name of learning discovery. Knowledge gained by discovery learning has several advantages, one of which is that knowledge will last longer in students' memories because in learning students are directly involved. Besides discovery learning arouses curiosity of students so that it will become more active.

CONCLUSION

The results of the development of scientific contextual based learning modules are stated to be very valid by the validator, so that they are suitable for use in learning activities. Learning activities using modules based on scientific contextual effectively increase student learning outcomes with N-gain acquisition of 0.481 (medium) in class VIII 6 and 0.446 (medium) in class VIII 7. Science process skills students experience increasement in each aspect, namely observing, classification, interpreting, and communication with N-gain scores are 0.08 (low); 0.05 (low); 0.25 (low); and 0.07 (low) for class VIII 6, while science process skills in class VIII 7 experienced an increase in each aspect with N-gain scores are 0.3 (medium); 0.3 (medium); 0.5 (medium); and 0.5 (medium).

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