Development of learning devicesBased inquired guidelines to improve science processing science Elementary school students

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Abstract- This study aims to produce learning tools based on guided inquiry models that are feasible to improve the science process skills of elementary school students. This research is a development research, with ADDIE model. The research trial design uses one group pretest-posttest design with quantitative descriptive analysis techniques and qualitative descriptions. The subject of this study is a learning device consisting of a syllabus, learning implementation plan, student worksheets, student teaching materials, tests on learning outcomes of science process skills. The trial was carried out on 40 students of grade five in elementary school. Data collection methods use validation, observation, tests, and filling out the questionnaire. The results of the analysis of the research data show: (1) the device developed is valid; (2) legibility of Student Book and Student Work Sheet at the independent level; (3) learning takes place in either category; (4) students become active in learning; (5) students give positive responses in the excellent category to learning; (6) science process skills show a high category. Based on the results of the study, it can be concluded that the guided inquiry-based learning device that has been developed is feasible to improve students' science process skills.

Index Terms- learning tools, guided inquiry, science process skills.

I. INTRODUCTION

Natural Sciences is one of the five subjects that must be mastered by Elementary School students. "Science is the study of events that occur in nature" (Sudana, et al, 2016: 2). Science learning is expected to be well understood by students so students can work and work to find things independently and meaningfully.

The most important thing in learning science is that students experience or feel what is taught with reality so that students will be convinced of what is taught and understood because they experience it directly, because in daily life there are many problems that can not be separated from the concept of science, therefore natural science learning quality requires a learning tool that can help students understand the science material well. The implication of the statement is that the teacher can teach well, the teacher must prepare a learning kit before teaching and learning activities begin. Thus, learning tools play an important role in the success of the learning process to support fluency in teaching and learning activities. Teachers are required to make effective and efficient teaching preparations. To make good planning and be able to carry out an ideal learning process, each teacher must know the elements of good planning, including: identifying student needs, learning objectives to be achieved, various relevant strategies and scenarios used to achieve goals, and criteria evaluation (Majid, 2014).

Learning will be more meaningful if students are given the opportunity to know and be actively involved in finding concepts from existing phenomena from the environment with the guidance of the teacher. One model of learning in order to achieve meaningful learning is guided inquiry learning. The use of guided inquiry is caused by the intellectual development of grade V elementary school students according to Piaget at a concrete operational level (Wood et al, 2011). That is, in this period children have been able to think logically, think with formal theoretical thinking based on propositions and hypotheses. To achieve these objectives requires the role of the teacher in learning.

The observations showed that most of the fifth grade students of Ujung XIII State Elementary School No.38, Semampir District, Surabaya City, in studying the natural sciences of hot material and the displacement had difficulty, learning outcomes showed 40 students got an average grade of students under the minimum completeness criteria (MCC) As for the MCC value in the school which is 78. This is due to learning that is not based on discovery so that in learning there is no set of natural processes such as the formulation of problems, making hypotheses, designing and conducting experiments, collecting and analyzing data and making conclusions. Then based on the results of the analysis of existing learning tools in schools including student teaching materials and student worksheets indicate if the discussion related to the material taught in student teaching materials has not been deep and has not

taught the science process skills, so it still needs to be developed so that the discussion becomes complete. To overcome these gaps, in learning researchers try to use guided inquiry learning models to improve students' science process skills. The tools developed include the Syllabus, Learning Implementation Plan, Student Teaching Materials, Student Worksheets, and science process skills tests.

The use of learning tools that have been developed can foster indicators of students' science process skills in predicting skills indicators students can interpret images or phenomena as initial hypotheses of research as revealed by Sheeba (2013) in her research.

Learning outcomes are the starting point used to monitor the level of achievement and intellectual power of students towards the learning process and material. The study of the achievement of learning outcomes will not be separated from the determination of the objectives of the learning indicators, so the learning objectives are a determining factor in determining the value of student learning outcomes. This relates to the opinion of Roesman (2012) which explains that learning outcomes are the indicated way to find out whether or not learning objectives have been achieved and also the learning process that has been carried out. Whereas the learning objectives of science develop process skills to investigate the natural environment, solve problems, and make decisions. Thus the relationship of learning outcomes is an increase in the science process skills.

Inquiry-based learning is very much needed to interpret the results of observations and convey information, because in the inquiry phase students are asked to analyze the results of experiments and submit conclusions, so the ability is needed. In addition, when students have the science process skills, students will be very easy and confident in conveying the information they know and conveying their arguments or opinions on a problem.

Science process skills are a set of skills used by scientists in conducting scientific investigations (Kemendikbud, 2013). Process skills need to be developed in science learning because they are able to bridge the achievement of science learning goals through inquiry learning models. According to Maria, et al (2015) the inquiry learning model proved to be very relevant and enjoyable, for elementary school students rather than learning science normally.

This guided inquiry learning model can improve the science process skills of students, because in the guided inquiry learning phase there are similarities with indicators of science process skills, ie students are required to find their own knowledge so that they can be absorbed well. In guided inquiry learning and science process skills students also teach this, so that both can be paired to obtain good learning.

Based on the description above, a study was conducted under the title *"Development of Guided Inquiry Based Learning Devices to Improve Science Process Skills of Elementary School Students"*

II. IDENTIFY, RESEARCH AND COLLECT IDEA

This research is a research development of learning tools consisting of: learning syllabus, learning implementation plan, student teaching materials, student worksheets, and tests of learning outcomes of science process skills, which aim to develop products and product effectiveness (validity).

The development model uses ADDIE which was adapted from Mulyatiningsih (2012: 183). The trial design of learning tools developed in research uses one group pretest-posttest design. The assessment of science process skills was tested on 40 students of 5B Ujung XIII No.38 Elementary School in the even semester of the 2019-2020 academic year. The methods used to collect data are validation, observation, tests, and questionnaires. Quantitative descriptive and qualitative descriptive analysis techniques.

III. WRITE DOWN YOUR STUDIES AND FINDINGS

Research result

1. Expert Validation

Expert validation is carried out by two validators. The assessment is focused on aspects of content, appearance and format. The validation results are presented in Table 1.

Table 1. Validation Results

No	Learning Media	Average (%)	Criteria
1	Learning Syllabus	82,22	Valid
2	Lesson plan	85,33	Valid
3	Student Book	80,68	Valid
4	Student Worksheet	80,87	Valid
5	Learning Outcomes Tests Scientific Process Skills	87,27	Valid

Source: processed secondary data of researchers, 2020

Based on Table 1, it is known that all validated learning tools are classified as valid. Nonetheless, learning tools can (properly) be used but with little revision before they are used in small group tests. The results of this validation are used to measure the validity of the learning device.

2. Small Group Test

Small group tests use revised learning tools based on input from the validator and are tested on a limited number of students. Small group test results are presented in Table 2.

Tabel 2. Small Group Test Results

No	Assessment Aspects	Score / Average	Criteria
1	Legibility		
	a. Student Book	91%	Independent level
	b. Student Worksheet	90%	Independent level
2	Implementation		
	a. Implementation of Teaching and Learning Activities (Introduction, Core, Closing)	3.65	Well
	b. Class situation	3.75	Well
	c. Time Management	3.42	Pretty good
3	Student Activity	82.64%	High
4	Student Response	82.33%	Well (positive)
5	Learning Outcomes of Science Process Skills		
	a. Average value		
	1) *Pretest*	56.6	Not complete
	2) *Posttest*	87.9	Complete
	b. Individual completeness		
	1) *Pretest*	2 out of 12 students ≥78	2 students complete
	2) *Posttest*	12 out of 12 students ≤ 78	12 students complete
	c. Completeness of Scientific Process Skill Indicators		
	1) *Pretest*	IndicatorsSPS ≥ 78	Not complete
	2) *Posttest*	IndicatorsSPS ≤ 78	Complete

Source: processed secondary data of researchers, 2020

Based on Table 2. It is known that the learning tools used in small group tests are classified as good. These results become a reference for researchers in revising learning tools, so they can get better results in field tests.

3. Field Test

Field testing is a real class test and involves students in greater numbers using the learning tools that have been tested previously on a small group test. Field test results are presented in Table 3.

Tabel 3. Field Test Results

No	Assessment Aspects	Score / Average	Criteria
1	Legibility		
	a. Student Book	94%	Independent level
	b. Student Worksheet	96%	Independent level
2	Implementation		
	a. Implementation of Teaching and Learning Activities (Introduction, Core, Closing)	3.65	Well
	b. Class situation	3.75	Well
	c. Time Management	3.42	Pretty good
3	Student Activity	82.64%	High
4	Student Response	82.33%	Well (positive)
5	Learning Outcomes of Science Process Skills		
	a. Average value		
	1) *Pretest*	50.62	Not complete
	2) *Posttest*	81.11	Complete
	b. Individual completeness		
	1) *Pretest*	3 out of 40 students ≥78	38 students complete
	2) *Posttest*	40 out of 40 students ≤ 78	40 students complete
	c. Completeness of Scientific Process Skill Indicators		
	1) *Pretest*	IndicatorsSPS ≥ 78	Not complete

2) *Posttest*	IndicatorsSPS ≤ 78	Complete

Source: processed secondary data of researchers, 2020

Based on Table 3. it is known that the learning tools used in the field test are classified as good. The results of this field test are the final data of the study and are used to measure the practicality and effectiveness of the learning tools.

Discussion

Research has succeeded in developing guided inquiry-based learning tools. The results showed that the learning tools developed were classified as valid, practical, and effective. This was obtained from the results of evaluating the validity, practicality and effectiveness of learning tools. Descriptions of the three assessments are described as follows

1. Validity

   Assessment of the validity of learning tools is measured based on the results of validation as stated by Nieveen (1999). Expert validation results show that all validated learning tools (learning syllabus, lesson plans, student teaching materials, student worksheets, and science process skills learning achievement test) are classified as valid criteria with a percentage of> 78% based on criteria established by Akbar (2013). The evaluation of the validator is focused on aspects of the content, appearance and format of the learning device, and is adjusted to the learning model used, in this case is a guided inquiry model. In the process of developing learning tools, the researcher seeks to establish a consistent linkage of each component of the learning device developed with the characteristics of the learning model applied as directed by Asikin & Cahyono (no years).

   Many suggestions provided by the validator, including the preparation of a more systematic learning syllabus, adjusting between the indicators and learning objectives in the preparation of the lesson plan, providing sources and information for images on student book and student worksheet. These suggestions become input for researchers to make a few revisions, so that learning tools can be used in small group tests and field tests.

2. Practicality

   Assessment of the practicality of learning tools is measured based on the results of the implementation of the lesson plan and student responses to the field test. The average value of the implementation of the lesson plan in the implementation of the Learning Activities (introduction, core and closing activities), class atmosphere and time management are classified as good with an average score> 3.61. These results indicate that learning has proceeded according to the plan as outlined in the lesson plan. According to Sudjana (2011), the ability required in the implementation of the teaching and learning process is the activeness of the teacher in creating and growing learning activities in accordance with the plans that have been prepared. While the results of the analysis of student response data showed that students gave positive responses (82.33%) towards learning activities and learning tools. Furthermore the reason students are because learning is done with a lot of practice, is fun and encourages them to find new ideas. Nur (2011) suggested that the use of guided inquiry models will make learning interesting, stimulating and enjoyable for students so that it will produce good responses.

3. Effectiveness

   Assessment of the effectiveness of learning tools is measured based on the results of learning science process skills in the field test. Analysis of the results of learning science process skills shows that all students completed individually (40 out of 40 students completed) and indicator of science process skills has reached 92.67% completeness. Based on this, it is known that the use of instructional devices based on guided inquiry can help students achieve mastery of learning outcomes (individual and SPS indicators). Similar to Fitri's research (2011) which reports that the use of guided inquiry models can assist students in achieving mastery learning outcomes of science process skills.

Based on this, it can be concluded that the use of guided inquiry-based learning tools can improve science process skills. This finding is supported by Rizal's (2014) study that guided inquiry influences students' science process skills.

IV. CONCLUSION

Based on the description above, it can be formulated that guided inquiry-based learning that is developed is determined to be feasible (valid, practical, and effective) to improve the science process skills of elementary school students on heat material and transfer it.

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The development of guided inquiry-based learning tools can improve students' science process skills so it needs to be developed more broadly in other science learning materials. The development of guided inquiry-based learning tools can be supplemented with lesson plan for remedial and enrichment activities aimed at further action for students who have not yet achieved mastery and have achieved mastery of process skills indicators.

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