

The Effectiveness of Inquiry Science Worksheet to Enhance Process Skill on Elementary Students Grade IV

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Abstract. The aim of this research is to know the effectiveness of science worksheet based on inquiry method to enhance student's process skills in problem solving. This research was conducted in SDKr Anak Panah Surabaya by using one group pretest-posttest design. Data obtained in this research is quantitative data and the number of students of class fourth was 20, student is referred to be completed the study if the proportion of correct answer is larger than standardized achievement test. While the class is said to be completed the study if 85% of the students achieving the criterion of standardized test. The researcher obtain the information about student's level of concepts mastery by using N-gain, one of the methods in descriptive qualitative analysis. It shows the differences of students' mastery level before and after the treatment is given. The effectiveness of science worksheet will be analyzed from the gain of learning outcomes. It resulted high point which means that N-Gain value is in adequate category, it can be said that the application of science inquiry worksheet enhancing students' process skills toward learning outcomes.

Keywords : Worksheet, Inquiry, Process Skills

INTRODUCTION

The ideal concept of learning is a two-way interaction between teachers and students in the teaching-learning process. In this case the teacher does not merely act as the leader or mentor who has full authority), but rather facilitators and motivators in teaching students, hence students can learn to actively and creatively. This ideal concept that has led to learning as a creative learning process [15].

In particular in science learning, teachers can do so through the lab simply by learning-based inquiry, the teacher has the tasks that are more specific, such as facilitating the students to be able to make observations and discussions in which this learning requires equipment and materials in learning. Thus, teachers must also know the procedures, concepts, and skills in teaching students. Because there is no difference in the learning stages of learning science with other subjects, the duties of teachers in the learning may include: preparing the lesson plan (RPP), carry out the teaching and learning activities, and conducting evaluations.

Permendikbud No. 67 of 2013. The curriculum was developed in 2013 on the theory of standard-based education, and the theory of competency-based curriculum. Education based on the standards set their national standards as a minimum quality of citizens that consist of content standards, process standards, competency standards, the standards of educators and education personnel, facilities and infrastructure standards, management standards, financing standards, and education assessment standards. Competency-based curriculum designed to provide the widest possibility of learning experience for students in developing the ability to act, knowledgeable, skilled, and act. Curriculum 2013 adheres to: (1) taught curriculum in the form of a process developed in the form of learning activities in schools, classrooms, and communities; and (2) direct learning experience students in accordance with the background, characteristics, and the ability of early learners. Direct learning experience of individual learners into the learning outcomes for themselves, while learning outcomes of all students into the curriculum outcomes [8]. The science process learning that in accordance with curriculum 2013 which is now being carried out by emphasizing the scientific approach. This can be done by giving direct experience to the student to develop their competencies in learning around nature scientifically [5].

Based on observations in the fourth grade SDKr Panah Surabaya, a science teacher at the school have yet to implement inquiry-based science teaching to improve the skills of the students. Obstacles that lead teachers have

not applied this learning because not understand how the implementation of these learning and teacher background that comes from not graduate to Teacher Training Education. Teachers find it difficult to understand subjects that are not of their background, so that the implementation is still conventional science teaching.

Science learning is directed to find out and involve so that students are engaged in improvity some knowledge related to problem solving skills and it's application [10]. In the implementation of the necessary science learning tools that support learning, including teaching materials, students' worksheet, media and others. Worksheet can be used to increase the activity of students in learning activities. Worksheet is also a learning tool that is used to guide the students in carrying out the work activity or both peorangan or group. It is also revealed by [9], that worksheet is one of the most important tools to achieve the goal of learning activities, as well [12] states that by utilizing the student worksheets easier to master the material and obtain optimal learning results. So that, in this study, we want to conduct reasearch entitled the effectiveness of inquiry science worksheet to enhance process skill on elementary students grade IV.

RESEARCH METHOD

Research Design

The activities undertaken during the development stage (stage 1) was to develop learning tools, composing instrument data collection, validation validator device, simulating a learning tool. While the activities carried out during the implementation phase (phase 2) in the form of implementation of learning using the first worksheet is the initial test (pre-test), the presentation of the subject matter, data collection, and a final test (post-test). In the final phase (phase 3) activities undertaken is analysis of the data to draw conclusions of research results.

This research using research and development method adopted from Borg and Gall model [13] can be done more simply involving 3 steps, namely: (1) preliminary stage, (2) design / model design (product), and (3) product testing.

The Implementation of Classroom Learning Tools

Data collection techniques conducted at the introduction stage using student responses and worksheets raters to reveal the current learning process include: the use of teaching materials LKS, student activities in learning, and skills of students in the learning process

The trials conducted using research design One Group Pretest-Posttest Design are included in the experimental design. So the experimental results is dependent variable was not solely influenced by the dependent variable. This can occur, in the absence of a control variable, and the sample was not selected randomly [13].

$O_1 \ X \ O_2$

O_1 is the initial test (pretest) to determine student mastery of the subject matter before the learning undertaken; O_2 is the final test (posttest) to determine student mastery of subject matter after learning implemented; and X is the treatment of inquiry learning with worksheets that have been validated and implement inquiry learning

The Collection Data Method

This research data collection method using the method of administration of the test which is performed twice, ie before the learning process begins and after the learning process. There is one kind of test that, THB (Test Results of Study). Achievement test product aims to regulate the cognitive aspects of student.

Analysis Data Technique

Data obtained in this research is quantitative data. The quantitative data obtained from the score of student competence which covers scores mastery of basic concepts of biology and its application in everyday life, whether cognitive performance scores of students. Mastery learning using descriptive analysis to determine student mastery learning (individual) can be calculated using percentages as follows: $KB = T/T_t \cdot 100\%$, where is KB is mastery learning; T is the number of scores obtained by students; and T_t is the total score.

Students are said to be complete learning (mastery people) if the proportion of correct answers students $\geq 75\%$ (KKM), and a complete classroom learning (classical completeness) if within that class are $\geq 85\%$ of students who have completed studies.

The data were analyzed with descriptive statistics. Statistical descriptions to answer research questions is only a statistical description of the average or percentage. To determine the student's mastery of concepts done using a qualitative descriptive analysis of N-gain. Gain mastery showed differences or understanding of the concept of students before and after a given treatment.

At the development stage, data collection techniques in limited trials are using questionnaires to capture student responses and teacher responses to developed products. In the expert validation test, the data collection techniques used are also in the form of questionnaires to see the validity which includes the construction, content conformity, and legibility of the developed product. Extensive testing stage using test collection techniques. Experimental content validation data, construction experts, and LKS legibility experts were analyzed by adapting the formula [14] as follows:

$$\%X_{in} = \frac{\sum S}{S_{maks}} \times 100\%$$

Where $\%X_{in}$ is response percentage, $\sum S$ is the sum of students score and S_{maks} is the maximum score.

The percentage of answers overall interpreted by [2] follows:

TABLE 1. Interpretation of validation sheets

Percentage	Criterion
80,1% - 100%	Very High
60,1% - 80 %	High
40,1% - 60%	Medium
20,1% - 40%	Low
0,0 % - 20 %	Very Low

The method of analyzing the data on the effectiveness of the developed product is evaluated from the evaluation of the students' critical thinking skills improvement through the value of pretes and postes. Methods of data analysis ie there is initial data analysis consisting of normality test and homogeneity test. Primary data analysis consists of analysis of pretest and posttest test results using n-Gain and t-test. The n-Gain test formula according to [6], as follows:

$$\langle g \rangle = \frac{(\%S_{post}) - (\%S_{pre})}{100 - (\%S_{pre})}$$

Where $\langle g \rangle$ is improved learning outcomes, S_{pre} is the average of pretest, and S_{post} is the average score of posttest

TABLE 2. n-Gain Criteria

n-Gain	Criteria
$\leq 0,3$	Low
$0,3 < \text{gain} \leq 0,7$	Medium
$> 0,7$	High

The formula of t-test [14] as follows :

$$t_{hitung} = \frac{\bar{x}_1 - \bar{x}_2}{S_g \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} \quad \text{dengan}$$

$$S_g^2 = \frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}$$

Where, t_{hitung} is Difference of two averages, X_1 is Average n-Gain students in the experimental class, X_2 is Average n-Gain students in the control class, S_g is Composite raw deviation, n_1 : The number of students in the

experimental class. n_2 is the number of students in the control class. S_1 is the standar deviation of experimental class. S_2 is the standar deviation of control class.

Analysis of student response data by using questionnaire about the attractiveness test on LKS that will be developed by giving score one for answer "Yes" and a zero score for the "no" answer. Obtaining scores from data sought by adapting the formula as follows:

$$P = \frac{\sum R}{\sum N} \times 100\%$$

Whete P is the percentage, $\sum R$ is the sum of response and $\sum N$ is the the sum of all response

RESULTS AND DISCUSSION

Students Learning Outcomes

Cognitive tests used to determine student learning outcomes as measured by the mastery of learning objectives. The purpose of learning is said to be complete when the proportion of correct answers students (p) ≥ 0.75 . Likewise, individual and classical completeness is said to be complete when ≥ 85 percent of the students had thoroughly studied. The sensitivity and thoroughness of learning outcomes can be seen in the following table

TABLE 3. Sensitivity items

No	Items	Sensitivity
1	1	0,77
2	2	0,66
3	3	0,55
4	4	0,44
5	5	0,44
6	6	0,66
7	7	0,44
8	8	0,55
9	9	0,44
10	10	0,44
Average		0,539

Based on the sensitivity of items, each item can be said to be sensitive to measure the learning effect because no items were negative sensitivity. This means that at the beginning of learning most students do not understand the process of scientific work properly, but after getting worksheet inquiry learning by using motion and force students to answer the questions correctly.

The development worksheet inquiry related to learning outcomes receive a score of 0.96 with High Gain values, besides the results of positive student responses interested in the learning process, so that the attitude of the interest in causes students try to learn the material more deeply, and the material obtained can be easily understood and more ingrained in students' memories. Some of these factors that led to student learning outcomes complete. This is consistent with the suggestion that the motivated learning, students achieve mastery can obtain a high learning outcomes [4]. Based on the sensitivity table items, all items of test assessment of learning outcomes is sensitive. Questions about the sensitive means to provide information that is the result of the assessment results, the lesson is oriented learning process skills. In accordance with the results of [1] said the skill learning process better than conventional learning.

TABLE 4. The Completeness of Learning Outcomes

No	Learning Outcomes Score			
	Score		The Completeness	
	Pretest	Post-test	Pretest	Post-test
1	40	90	TT	T
2	50	100	TT	T
3	60	100	TT	T
4	40	100	TT	T
5	40	90	TT	T
6	30	100	TT	T
7	40	100	TT	T
8	50	100	TT	T
9	40	100	TT	T

10	30	90	TT	T
11	45	88	TT	T
12	40	92	TT	T
13	35	100	TT	T
14	40	95	TT	T
15	25	89	TT	T
16	30	90	TT	T
17	30	100	TT	T
18	40	95	TT	T
19	35	100	TT	T
20	25	100	TT	T
N-Gain		0,96 (High Gain)		

Based on the results of the validator record, the result of the evaluation of the validation of Inquiry worksheet is stated to have good criteria with little revision, then applied in the learning process and observation by 2 observers and the average of Inquiry worksheet assessment from both observers is 3.89 which means Inquiry worksheet development results are quite good and can be used with 99.35 reliability values. Response by students, obtained: Based on the average percentage of students' opinion is known 100.00% of students interested in the activity component, 90.74% of students feel new to the components of activities, 90.74% of students feel easy to follow the components of activities undertaken, 100.00% find it easy to do test questions, 88.89% feel new with model problem. Students also argue newly with the process test model and feel not new to cognitive tests. The effectiveness of worksheet on improving students' process skill is measured through pretest and postes grade of experimental class and control class with n-Gain test and t-test. The n-Gain test is used to recognize a large increase in the students' process skills. Test-t to know the significance of improvement Student learning outcomes.

The applied classroom learning using worksheet based inquiry is higher than the class that applied conventional learning. Based on hypothesis testing it is concluded that learning using worksheet based inquiry is effective in improving students' process skill in motion and style material. In the picture shows that the average n-Gain of the students' process skill in the control class is 0.27 with the low criterion while the average n-Gain of student process skill in the experimental class is 0,47 with the medium criterion. This suggests that the average n-Gain of students 'critical thinking skills in the experimental class is higher than the average n-Gain of the students' process skills in the control class. After the n-Gain test, the pretest and posttest values are t-tested.

The result of t-test analysis for equality test of two average pretest value get result $-t_{1-1/2\alpha} < t_{hitung} < t_{1-1/2\alpha}$ ($-1,994 < 0,214 < 1,994$) mean mean pretest value of critical thinking ability of student in The experimental class did not differ significantly with the mean pretest of students' critical thinking skills in the control class, so the two classes could serve as the study class.

The result of t-test analysis for test of difference of two average n-Gain of experiment class and control class yielded $t > t_{(1-\alpha)}$ ($8,89 > 1,99$), it was concluded that reject H_0 , N-Gain students' process skills on motion and style materials at the start of learning by conveying indicators and learning objectives. This stage is important for students to understand what they are trying to accomplish in their learning. Then the teacher orients students on the phenomenon or problem in the form of facts, statements or questions relating to the material to be taught. Such discourse or phenomenon is conducted to explore students 'early ability on the material so that the student's skill indicator "able to identify problem solving variables" can arise and increase students' curiosity.

CONCLUSION

The research on the effectiveness of the use of student worksheets science-based inquiry to improve process skills of elementary school students in grade IV on learning outcomes in the cognitive domain have generated learning device comprising: (1) RPP, (2) LKS, (3) achievement test. From the results of data analysis and discussion of the results of research on the effectiveness of the use of student worksheets ipa-based inquiry to improve the skills of the fourth grade primary school students, it can be concluded that: learning to use the inquiry worksheet which the high gain value is 0.96.

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