

Development of Lesson Devices Used Guided Inquiry Learning with Calor Material React Strategy to Improve Science Skills Process on Elementay School Students

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Abstract:- The purpose of this study is to determine a valid, practical, and effective Guided Inquiry learning material to improve students' science skills process. Guided Inquiry with REACT strategy to improve students' science skills process in the calor material of Class V on sixth Theme of second Sub Theme. This research is a research development of learning materials that refers to the Rick and Carey development model and tested on fifth grade students in Romokalisari 132 Surabaya with One Group Pretest-Posttest Design. The tools to be developed are the syllabus, lesson plan, Student Textbooks, and Student Worksheets, and science skills process tests. Practical learning materials based on the implementation of lesson plans that are categorized as good and active student activities while learning and they are effective based on the results of the Science Skills Process test that shows of 11 students have high n-gain and 4 students categorized as moderate n-gain and got very good student response. It can be concluded that the Guided Inquiry based on learning material with REACT strategy is valid, practical and effective so that it is used to improve the science process skills of fifth grade students on sixth theme of second Sub Theme in calor material.

Keywords:- Learning Material, Guided Inquiry, REACT Strategy, Science Skills process.

I. INTRODUCTION

The scientific process is the forerunner to the formation and development of science. In science learning, to create meaningful learning students should be actively involved in the scientific process. Science is not only prioritizing products, but also the acquisition of concepts or new knowledge through the process is also very important in order to build student knowledge. Science learning should be able to train and direct students to have the skills to look for and information process using thought processes based on scientific work steps such as observing, measuring, classifying, making conclusions, conveying or communicating and findings often referred to as science process skills (PPP) (Prasojo, 2016)

Student representation ability can be improved by using the REACT strategy. The REACT strategy is the development of a contextual learning approach. The REACT strategy stands for Relating, Experiencing, Applying, Cooperating, and Transferring (Yuniawatika, 2011). In the same line, it was stated by Bayraktar (in Aydogdu et al, 2014) shows that the problems tested at TIMSS mostly evaluate argumentation skills, problem solving, analysis and synthesis, formulating hypotheses, making predictions, making experiments, designing experiments, generalizing, and evaluating experimental procedures. Based on this it can be said that the low science results of TIMSS shows that the science process skills of students in Indonesia are also at a low level.

The science process skills of students in Indonesia are low due to the lack of teachers in mastering the appropriate learning strategies so that students' KPS are hampered and cannot develop. Associated with the importance of learning science, then in formal education especially at the level of basic education it is necessary to reform or change learning because looking at the facts that occur there is still a lot of science learning that is conventional (Latifah et al, 2017).

Based on the results of the above explanation, we need a new breakthrough in the learning process that is able to involve students actively and creatively in mastering KPS. One of these new breakthroughs is the use of guided inquiry learning models (guided inquiry) with the REACT strategy. The Inquiry Learning Model is a series of learning activities that emphasizes the process of thinking critically and analytically to seek and find answers to the problem being cultivated. The guided inquiry learning model engages students in answering teacher questions. Students conduct investigations, while the teacher guides them in the right direction (Sanjaya, 2011).

The guided inquiry based learning model with REACT strategy is expected to improve students' science process skills. Students' scientific process skills are all scientific skills that are used to discover concepts or principles or theories in order to develop existing concepts or refute previous discoveries. KPS is a unique intellectual skill, which is used by all scientists. KPS can be divided into two, namely basic KPS and integrated KPS (Prasojo, 2016).

II. METHOD

The Dick and Carey Development Model is a reference model in this study. The research variable is about the validity of the feasibility of Developing Guided Inquiry Based Learning Devices with REACT Strategy of Heat Material to Improve Science Process Skills. Practical use of lesson plans in Guided Inquiry-based learning with REACT Strategy in calor Material to Enhance Science Skills Process and what obstacles are encountered during learning process.

The effectiveness of learning devices is based on improving science skills process and student responses before and after learning.

Data collection by observation, questionnaire distribution and test. Analysis of the data used quantitative descriptive analysis, which are done as followed:

A. Analysis of the validity and reliability of learning devices

Validation Interval Score	Research Category	Information
$3,6 \leq SV < 4$	Very valid	Can be used without revision
$2,6 \leq SV < 3,5$	Valid	Can be used with minor revision
$1,6 \leq SV < 2,5$	Less Valid	Can be used with major revision
$1,0 \leq SV < 1,5$	Not valid	Can not be used and need consultation

Information:

SV = validation score(Ratumanandan Laurens, 2011)

Table 1:- Categorization Criteria for Validity and Learning Devices

➤ *Learning Device Reliability Criteria*

$$r_{11} = \left(\frac{n}{n-1} \right) \left(\frac{S^2 - \sum pq}{S^2} \right)$$

B. Analysis of the Lesson Plan Implementation in Learning ImplemetationRencanaThe learning implementation can be gained from the formula below:

$$P = \frac{\text{the number of lesson planed are implemented}}{\text{the number of lesson plan steps}} \times 100\%$$

Interval	Category
$0\% \leq P < 25\%$	Not implemented
$25\% \leq P < 50\%$	Poorly implemented
$50\% \leq P < 75\%$	Good implemented
$75\% \leq P < 100\%$	Very well implemented

Table 2:- Percentage of RPP Implementation Criteria (Riduwan, 2012)

Average score of interval	Average score of criteria
1,00 – 1,8	Very bad
1,9 – 2,7	Not good
2,8 – 3,6	Good
>3,6	Very good

Table 3:- AverageScore of Interval and Average Score of Criteria Implementation of Learning Models (Adapted fromRatumanan& Laurens, 2006)

C. Analisis of Student Activity

Data from observations of student activities during the learning process were analyzed with descriptive statistics. The formula used to calculate these student activities are:

$$A_s = \frac{\sum A}{N} \times 100 \%$$

Information:

As = Percent of Student Activity

$\sum A$ = number of frequencies per Student Activity that appears

N = Total number of Student Activity frequencies

The percentage criteria for Student Activity are as follows:

Percentages (%)	Criteri
00 – 20	Very bad
21 – 40	bad
41 – 60	Good enough
61 – 80	Good
81 – 100	Very good

Table 4 :- Criteria of student creativity (Riduwan , 2012)

D. Analysis of Science Skill Process Ability

The percentage of individual completeness is calculated using the following formula:

$$\text{Individual Achievement} = \frac{\text{The number of gaining score} \times 100\%}{\text{Maximum score}}$$

Minimum criteria of sixth theme on second sub theme is 75. The Minimum criteria was analyzed by researchers based on Permendikbud No. 23 of 2016 then the values obtained were converted based on the following range of values.

No	Score	Predicate	Information
1	88-100	A	Very good
2	74-87	B	Good
3	60-73	C	Good enough
4	<60	D	Poor

Table 5:- Range of Competency Scores for Student Science Process Skills

The magnitude of the increase or N-gain (Hake, 1999) is analyzed using the following formula.

$$ng = \frac{(Sp_{post}) - (Sp_{pre})}{skor\ max - (Sp_{pre})}$$

Information:

g (gain) = improvement in science process skills

S pre = pretest score

S post = posttest score

While the gain classification is as follows:

$$g\text{-height} = (g) \geq 0.7$$

$$g\text{-moderate} = 0.7 > (g) \leq 0.3$$

$$g\text{-low} = (g) < 0.3$$

1. Analysis of Students' response

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

Percentages	Criteria
0% - 20%	Very weak
21% - 40%	weak
41% - 60%	enough
61% - 80%	strong
81% - 100%	Very strong

Table 6:- Criteria of Students respon

III. FINDING AND DISCUSSION

A. The Validity of Learning Process

Validated components of this learning process are lesson plan, students' worksheet and literacy tests, these components meet the valid categories and need a little revision to be used.

No	Aspects	Validator scoring		Category
		V1	V2	
I	Content	3,25	4,00	Very valid
II	Language	3,50	3,50	Valid
III	Time	3,70	4,00	Very Valid
Average score				Very Valid
Realibility		95,21%		Reliable

Table 7:- Validity result of syllabus

No	Aspects	Validator scoring		category
		V1	V2	
I	Format	4,00	4,00	Very Valid
II	content	3,70	4,00	Very Valid
III	Language	4,00	3,30	Very Valid
Average score				Very Valid
Realibility		98,70%		Reliable

Table 8:- The result of lesson plan

No	Aspects	Validator Scoring		Category
		V1	V2	
1	Write down the objectives of the activities developed in students worksheet	4,00	4,00	Very Valid
2	Written Activity based on instructions	4,00	4,00	Very Valid
3	Supporting information is presented as preliminary knowledge in carrying out activities	4,00	4,00	Very Valid
4	completinga drawings or tools and materials for discussing or conducting experiments	4,00	4,00	Very Valid
5	Writing steps in a coherent and correct manner and does not lead to double interpretation	4,00	4,00	Very Valid
6	Providing space to write adequate observational / experimental data	4,00	4,00	Very Valid
7	Write assignments that improve students' science process skills	4,00	4,00	Very Valid
8	Assignments are structured to guide students in reasoning and associating as part of the Guided Inquiry process that leads to making conclusions	4,00	4,00	Very Valid
9	Providing space for writing conclusions	4,00	4,00	Very Valid
Average score				Very Valid
Reliabilities		100%		Reliable

Table 9:- The result of studnets worksheet validity

No	Aspects	Validator scoring		category
		V1	V2	
1	Validity content	3,00	4,00	Valid
2	Language and tasks	3,00	4,00	Valid
Average score				Valid
Reliability		85,71%		Reliable

Table 10:- The result of KPS

1. Implementation of Lesson Plan

The results of the implementation analysis on the Lesson Plan Implementation get a very well implemented category with a percentage of 94.4%.

Information	Lesson plan in every meeting			Average
	RPP 1	RPP 2	RPP 3	
The aspects are implemented	16	17	18	
The aspects are not implemented	2	1	0	
Implementation	88.9%	94.4%	100%	94.4%

Table 11:- Presentage of Lesson plan implementation

No	Aspeks	Scoring			Average	Category
		RPP 1	RPP 2	RPP 3		
A	Introduction	3.2	3.8	3.8	3.6	good
B	Content	3.5	3.7	3.8	3.7	Very good
C	closing	3.7	4.0	3.7	3.8	Very good
D	Classroom situation	3.0	3.0	3.8	3.3	good
Average						good
Reliability					92.96%	Reliable

Table 12:- The result of Lesson Plan implementation

B. Analysis of student activity

No	Observation activity	The number of students in doing activity			average
		RPP 1	RPP 2	RPP 3	
1	Listen to the teacher's explanation	15	15	15	15
2	Reading teaching materials	12	13	14	13
3	Conduct activities that create a conducive learning atmosphere	12	13	13	13
4	Formulate the problem	8	10	10	9
5	Make a hypothesis	9	10	13	11
6	Gather data to test hypotheses	15	15	15	15
7	Test the hypothesis according to the data collected	14	15	15	15
8	Make conclusion	8	10	12	10
Total		93	101	107	100
Students activity (%)		77.50	84.17	89.17	83.61
Reliability (%)		87.32	91.40	94.27	91.07

Table 13:- The result of students activity observation

C. Analysis of students' activity

No	Measurement aspects	Response percentages (%)	
		strong	weak
1	Teaching materials, learning atmosphere, ways of teaching teachers and Guided Inquiry stages directed at interesting learning	agree	disagree
		100	0
2	Teaching materials, learning atmosphere, ways of teaching teachers and Guided Inquiry stages directed in learning is quite new	agree	disagree
		100	0
3	Teaching materials, learning atmosphere, teacher teaching methods and Guided Inquiry stages directed towards learning are easy to be understood	agree	disagree
		100	0
4	Teacher explanations and guidance are clear and easy to understood	agree	disagree
		93	7
5	Ways for teachers to implement Guided Inquiry-based learning are easy to be understood	agree	disagree
		80	20
6	The Science Process Skills test questions made are quite easy to do	agree	disagree
		87	13
7	Item of Science Process Skills created is quite new	agree	disagree
		100	0
8	Guided Inquiry learning makes learning more interesting.	agree	disagree
		93	7
The percentage of students response		94%	6%

Table 14:- Student Responses to Guided Inquiry Based Learning Models with REACT Strategies

D. Analysis of Science skills process

Students' code	Pretest		Posttest		N-gain	N-gain criteria
	Score	Information	Score	Information		
S1	30	Failed	95	Success	0.93	g-tinggi
S2	70	Failed	100	Success	1.00	g-tinggi
S3	50	Failed	80	Success	0.60	g-sedang
S4	35	Failed	95	Success	0.92	g-tinggi
S5	70	Failed	80	Success	0.33	g-sedang
S6	35	Failed	95	Success	0.92	g-tinggi
S7	30	Failed	90	Success	0.86	g-tinggi
S8	70	Failed	100	Success	1.00	g-tinggi
S9	45	Failed	75	Success	0.55	g-sedang
S10	35	Failed	90	Success	0.85	g-tinggi
S11	10	Failed	60	failed	0.56	g-sedang
S12	80	Success	100	Success	1.00	g-tinggi
S13	25	Failed	95	Success	0.93	g-tinggi
S14	60	Failed	90	Success	0.75	g-tinggi
S15	30	Failed	95	Success	0.93	g-tinggi
Average	45.00	Failed	89.33	Success	0.81	g-tinggi
The number of failed students	14		The number of failed students	1		
The number of success students	1		The number of success students	14		
Percentages of completeness (%)	7%		Percentages of completeness (%)	93%		

Tabel 15:- Hasil Pretest dan Posttest

The Calculation of N-gain from the limited trial results shows that the high category is 11 children and 4 children are in the moderate category. If the overall N-gain average is calculated, 0.81 results will be obtained, which means the N-gain pretest and posttest are high. Based on the results of the N-gain normality test, Guided Inquiry based learning with REACT strategy is effective in improving students' science process skills.

IV. SIMPULAN DAN SARAN

Learning devices based on *Guided Inquiry* with REACT strategy which is developed is are feasible to improve students' science process skills in very effective way to improve students' science skills. The learning devices is improved from the learning achievement of KPS test and students' response toward the development leaning material. So it can be categorized in the whole learning devices which is improved is very effective for enhancing student science skills process.

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