DEVELOPING SCIENCE LEARNING INSTRUMENTS BASED ON LOCAL WISDOM TO IMPROVE STUDENT’S CRITICAL THINKING SKILLS

PENGEMBANGAN PERANGKAT PEMBELAJARAN IPA BERBASIS KEARIFAN LOKAL UNTUK MENINGKATKAN KEMAMPUAN BERPIKIR KRITIS SISWA

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ABSTRAK

Penelitian ini bertujuan mengembangkan perangkat pembelajaran IPA yang berupa Buku ajar, LKS, Silabus, dan RPP berbasis kearifan lokal untuk meningkatkan kemampuan berpikir kritis siswa SMP. Indikator kemampuan berpikir kritis siswa mencakup interpretasi, analisis, evaluasi dan inferensi. Penelitian ini merupakan penelitian Research and Development dengan metode Analysis, Desain, Development, Implementation and Evaluation (ADDIE). Validasi ahli dilakukan dengan uji expert terkait dengan format, isi/materi, dan bahasa. Instrumen yang digunakan dalam pengambilan data adalah dokumentasi, lembar validasi, lembar observasi, dan tes. Hasil uji coba instrumen di kelas VII SMP Bustanul Ulum Panti Kabupaten Jember menunjukkan adanya peningkatan kemampuan berpikir kritis siswa, baik yang diambil dari teknik tes maupun observasi. Berdasarkan indikator kemampuan berpikir kritis diperoleh nilai rata-rata N gain 0,47 dengan interpretasi sedang. Simpulan penelitian ini menunjukkan perangkat pembelajaran IPA berbasis kearifan lokal yang dikembangkan dalam kategori valid sehingga cukup efektif dalam meningkatkan kemampuan berpikir kritis siswa.

ABSTRACT

This research aims to develop learning instruments of science i.e. textbook, student worksheet, syllabus, and lesson plan based on local wisdom that can improve critical thinking skills of junior high school students. Indicators of student's critical thinking skills include interpretation, analysis, evaluation and inference. This study is a Research and Development by using analysis, design, development, implementation and evaluation (ADDIE) method. Expert validation was conducted with the expert test related to the format, content/material, and language. The instruments were used on the collection data are documentations, validation sheets, observation sheets, and tests. The result of the instrument in the 7th grade of junior high school at Bustanul Ulum Panti Jember showed that there are the improvement of critical thinking skills of student based on the data from test and observation. According to indicator of critical thinking skills, the n-gain value is around 0,47, means moderate interpretation. The conclusions of this research are the learning instruments of science based on local wisdom which develop in the valid category is quite effective to improve students' critical thinking skills.

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Keywords: Critical Thinking, Learning Instrument, Science.

INTRODUCTION

The related policy about inserting local wisdom program in the standard of a curriculum and underlined the reality that Indonesia has cultural diversity. So the content standard in implementation of Kurikulum Tingkat Satuan endidikan (KTSP) stated that science learning
Developing Science Learning Instruments Based On Local Wisdom To Improve

Critical thinking skills depend on the nature of learning science. Critical thinking also trains the students to think logically and don’t accept something easily. According to Staib (2003) critical thinking skills were important to help students to develop their talent, train to concentrate and focus on problems and think analytically.

Critical thinking skills depended to the exercises had been often done (Dwyer et al. 2012). That reality was seen in the school, it showed that on learning science, the students were still based on theory only and less of improving critical thinking skills. Student’s enthusiastic in answering the question were still theoretical and have not showed their talent. Besides that, there were still some students who difficult working in a group, communication, solve the real problem, and could not take decision as suitable solution on the problems.

Based on background and identifying the problems above, so the objective of this research is developing science learning instruments based on local wisdom to improve student’s critical thinking skill in the 7th grade of junior high school at Bustanul Ulum Panti Jember.

METHODS

This study is research and development (R&D) with ADDIE (Analysis, Design, Development, Implementation, Evaluation).
lopment, Implement and Evaluate) method. There are three steps in this research. Analysis step is conducted by investigate the student’s condition who has low critical thinking skills and then make goal setting to improve student’s critical thinking skills. Design step is determination of critical thinking indicator, determination learning material and making natural science learning instruments based on local wisdom including textbook, student worksheet, syllabus and lesson plan. The next step is Development, conducted by packaging activity about natural science learning instruments based on local wisdom. It is also conducted by expert validation related to natural science learning instruments based on local wisdom result with 3 experts. Expert validation covers format, content/material, and language. On the end of this step, it will create the science learning instruments based on local wisdom that has valid validity and ready to be implemented.

The product that has been revised will be ready to be implemented to user. The users are students to know interaction between product and students. The product is science learning instruments based on local wisdom tested to 25 students in the 7th grade of junior high school at Bustanul Ulum Panti Jember. It was conducted with one shot case study through the result of pre test dan post test. Based on pre test, implementation, and post test will conducted normal gain test with equation 1.

\[
g = \frac{X_m - X_n}{100 - X_n} \]

With
- \( g \) = gain value
- \( X_m \) = post test value
- \( X_n \) = pre test value

To interpret gain value, used guide on Table 1.

<table>
<thead>
<tr>
<th>N gain value</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>( g \geq 0.7 )</td>
<td>High</td>
</tr>
<tr>
<td>( 0.7 &gt; g \geq 0.3 )</td>
<td>Moderate</td>
</tr>
<tr>
<td>( g &lt; 0.3 )</td>
<td>Low</td>
</tr>
</tbody>
</table>

Bustanul Ulum Panti Jember was chosen as test location because it is located in Panti specially Kemiri Kali Kepuh Gunung Pasang Jember, where that area is the coffee estate which is very excellent produk in Jember. Most of students at that school are children from the society around who works in coffee estate. Generally, the students at that school know about coffee, but they don’t know about the history, benefit and what substance of coffee. It is not good because the students who live in coffee estate don’t know about the condition around them.

Instruments of research in this study are Format of learning formulation for each subject contains and material with critical thinking skills indicator, judgement format for science education expert, test for assessing critical thinking skills, questionnaire to measure the students and teacher’s difficulties in using instrument, format of observation form of student’s critical thinking skills in doing experiment, and interview guideline to complete data from questionnaire and observation.

RESULTS AND DISCUSSION

The main product of this research is science learning instruments based on local wisdom. Those are Syllabus, lesson plan, student worksheet and textbook. Before implementation, the instruments are validated by expert judgment.

The first step was syllabus analysis arranged based on curriculum 2006 as basic to arrange syllabus, lesson plan, student worksheet and textbook. Syllabus and lesson plan were arranged based on PP No 19 Tahun 2005 pasal 20. Lesson plan and textbook were arranged as suplement for teacher and student to complete science learning instruments based on local wisdom. This textbook shows essential concept based on KTSP 2006, supported figures based on the condition around student’s environment, example, and question.

On Design and Development step, the researcher designed the textbook and student worksheet based on students’ environment. It was developed so that the students had awareness to their environment.

Local wisdom environment in each place in Indonesia should be explored and done by Indonesian people (Malau, 2013). Most of local wisdoms haven’t been known by young generations. How to bequeath local wisdom to young generation? The answer is through education.

Learning instruments based on local wisdom has been produced in the form of syllabus, lesson plan, textbook, students worksheet, and assessment to improve student’s critical thinking skills in the junior high school Bustanul Ulum Panti Jember. The learning instruments
contains competencies, indicators and goals of learning, essential concepts based on curriculum 2006, the activities of students in a form of experimental instruction, pictures and photos, problem examples, and exercises based on coffee estate.

On the implementation step, it was conducted by implementation in the junior high school Bustanul Ulum Panti Jember during 4 months (July till September 2015). The objective of this implementation was to make assessment from experts and teacher. Student’s response related to use of the result of the science learning instrument based on the local wisdom by expert judgment shown in Table 2.

Table 2. The result of expert’s validation on science learning instruments based on local wisdom.

<table>
<thead>
<tr>
<th>Nu</th>
<th>Learning Instruments</th>
<th>Total Score</th>
<th>Average</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Content/ Material</td>
<td>105</td>
<td>4.20</td>
<td>Valid</td>
</tr>
<tr>
<td>2</td>
<td>Format</td>
<td>108</td>
<td>4.32</td>
<td>Valid</td>
</tr>
<tr>
<td>3</td>
<td>Language</td>
<td>109</td>
<td>4.36</td>
<td>Valid</td>
</tr>
</tbody>
</table>

* Learning Instruments (Syllabus, Lesson Plan, Textbook, Students Worksheet, Assessment)

Table 2 shows the result of questionnaire assessment by experts from content/material, the score is about 4.20. This score was got from the average of validation score, where the total score of validation is 105 then divided to the total of statement aspects (25), so science learning instruments based on local wisdom from content/material got 4.20. While from the format, the score is 4.32, and from the language it is 4.36. Science learning instruments based on local wisdom is valid if total score above or equal to 4.00 and less valid if it below 4.00 (BSNP, 2008). Thus it can be concluded that science learning instruments based on local wisdom has valid criteria to be used. On this step, we also get suggestion from the experts i.e. a little correction about concept so that there is no mistakes and suitable with EYD.

The result of questionnaire shows that the teacher’s response is 79% lies on good category. Teacher’s response of lesson plan on good category is 76%, lesson plan is 76%, and very goog response is 80% and 84% on textbook and student worksheet. Result of the teacher’s response on science learning instruments based on local wisdom can be seen on Table 3.

Table 3. The result of teacher’s response of science learning instruments based on local wisdom.

<table>
<thead>
<tr>
<th>Nu</th>
<th>Instruments</th>
<th>Total Score</th>
<th>%</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Syllabus</td>
<td>19</td>
<td>76</td>
<td>Good</td>
</tr>
<tr>
<td>2</td>
<td>Lesson Plan</td>
<td>19</td>
<td>76</td>
<td>Good</td>
</tr>
<tr>
<td>3</td>
<td>Textbook</td>
<td>20</td>
<td>80</td>
<td>Very Good</td>
</tr>
<tr>
<td>4</td>
<td>Student Worksheet</td>
<td>21</td>
<td>84</td>
<td>Very Good</td>
</tr>
</tbody>
</table>

Average 79 Good

Based on 25 students of 7th grade of Junior High School who give the questionnaire back, generally from textbook 72% students choose good and very goog category and only 28% who choose moderate, low and very low. While from student worksheet 84% students choose good and very good category, and only 16% choose moderate, low and very low category. Result of the student’s response on the science learning instruments based on local wisdom as shown in Table 4.

Table 4. The result of student’s response about science learning instruments based on local wisdom.

<table>
<thead>
<tr>
<th>Nu</th>
<th>Learning Instruments</th>
<th>Total of Students</th>
<th>Percentage</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Student book</td>
<td>18</td>
<td>72</td>
<td>Good and very good</td>
</tr>
<tr>
<td>2</td>
<td>Student worksheet</td>
<td>21</td>
<td>84</td>
<td>Good and very good</td>
</tr>
</tbody>
</table>

In this research, besides validation of science learning instruments based on local wisdom, also be expected to improve student’s critical thinking skills, because many people think that somebody which has critical thinking skills if we can debate in public. Even though, critical thinking has wider meaning than that. Arnyana (2008) Reported that critical thinking was skill to solve the problem. While Ibrahim (2008) stated that critical thinking is skill to do knowledge investigation or something believed based on the supported fact. Critical thinking is defined as reflective thinking and reasonable to decide what is believed or done. On Bloom’s taxonomy, Cognitive domain as critical thinking definition is synthesis, analysis, and evaluation. Based on that definition, characteristics of critical thinking include active process, reflective, reasonable that direct to decide what sure thing done. Ong and Borich (2006) defines critical thinking from a pedagogic perspective
and calls it an ability to identify issues and assumptions, recognize important relationships, make correct inferences, evaluate evidence or authority and deduce conclusions.

Evaluate step was conducted by analyzing critical thinking skills i.e. determine indicator process of student’s critical thinking skills in the science learning that would be improved. The determination of indicator was based on literature review related to the critical thinking skills. Table 5 shows the information on indicator of the development and activity of the student’s critical thinking skills.

Table 5. Indicator and student’s critical thinking activity

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interpret</td>
<td>Compare various, criteria, regulation or procedure in getting data</td>
</tr>
<tr>
<td>Analyze</td>
<td>Identify actual proofs and connecting among concepts</td>
</tr>
<tr>
<td>Evaluate</td>
<td>Assess credibility of question and description</td>
</tr>
<tr>
<td>Inference</td>
<td>Account the statement based on element need related to conclude the problems</td>
</tr>
</tbody>
</table>

After conducting good preparation in Design and Development step so it was ready to be implemented to 25 students of 7th grade of Junior High School of Bustanul Ulum Jember. The result and implementation of developing science learning instruments based on local wisdom is moderate category. Based on N gain value it shows that student’s skill in interpretation and evaluation get 0.46. The inference has the lowest value (0.44) if it is to be compared with indicator of another skills. From all indicators, the average N gain is 0.47 with moderate interpretation.

Table 6. The comparison result of pre test dan post test value each students’ critical thinking indicator

<table>
<thead>
<tr>
<th>Indicator</th>
<th>N</th>
<th>Xn</th>
<th>Xm</th>
<th>N gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interpret</td>
<td>25</td>
<td>60.5</td>
<td>78.8</td>
<td>0.46</td>
</tr>
<tr>
<td>Analyze</td>
<td>25</td>
<td>62.3</td>
<td>82.3</td>
<td>0.53</td>
</tr>
<tr>
<td>Evaluate</td>
<td>25</td>
<td>63.6</td>
<td>80.3</td>
<td>0.46</td>
</tr>
<tr>
<td>Inference</td>
<td>25</td>
<td>60.2</td>
<td>77.7</td>
<td>0.44</td>
</tr>
<tr>
<td>N gain average</td>
<td></td>
<td></td>
<td></td>
<td>0.47</td>
</tr>
</tbody>
</table>

The result of critical thinking skills have significant improvement using science learning instruments based on local wisdom. It is caused by the change of learning instruments that can improve the student’s critical thinking skills, especially on classify, assume, predict, hypothesize, analyze, conclude, and evaluate. This result similar to the other researcher (Susanti, 2012) which developing practicum guideline of genetics could train student’s critical thinking skills. Further, Hassoubah was reported that people who think critically will evaluate and then conclude something based on fact to make a decision. So one of people characteristics who think critically will always look for and explain relation between the problem discussed and the relevant experience.

The meaning of critical thinking often depends on values and culture; for example, in some cultures, being critical may be interpreted as “argumentative” or “being critical of others” (Ibrahim, 2008). Critical thinking is think reasonably and reflective through emphasize making decision about what is believed and done. Critical thinking is activities of analyzing idea to more specific, differ sharply, choose, identify, study and develop to make it more perfect.

Critical thinking skills are real proof that needed in learning activity. Johnson (2007) was stated that critical thinking is an integration process that enabled somebody to evaluate the argumentation, assumption, logical and language that underlie what people’s thinking. The process of critical thinking can be known through student’s skill in giving verbal reasoning, analyzing argument, thinking a hypothesis, using probability and uncertainty, making decision in solving the problems (Kempf, 2012). This statement show that critical thinking skills begin with doing analysis process of case then gives idea related to proof the case and the end is able to take a decision in problem solving. Hyytinen et al (2015) also was explained that critical thinking skills were skills to analyze, interpret, evaluate and solve the problems.

Science learning instruments based on local wisdom was concentrated on giving problem and case. It was quite effective to give impact of develop student’s critical thinking skills. Popil (2011) was reported that the giving some case on the study are effective method to promote the facilitation of active learning, helping clinical problems and to encourage student’s critical thinking skills. Through that case study, the students will begin to compare data invention, make invention of relation, make argument and look at the problems back till make decision.
CONCLUSION

Based on the results, it can be concluded that science learning instruments based on local wisdom has been valid and reasonable to be used in junior high school because it getting value 4.20, 4.32, and 4.36 from expert validation. Besides that, science learning instruments based on local wisdom that has been developed can improve student’s critical thinking skills because N gain average value is 0.47 with moderate interpretation. Local wisdom should be conserved and implemented in education. Education activities that can be done are integration of local wisdom in lesson content/material, developing test, developing textbook, and developing instructional model.

REFERENCES


