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DEVELOPING SCIENCE LEARNING INSTRUMENTS BASED ON LOCAL WISDOM TO IMPROVE STUDENTS' 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 interprestasi, analisis, evaluasi dan inferensi. Penelitian ini merupakan penelitian *Research and Development* dengan metode *Analysis, Desaign, Development, Implimentation and Evaluastion* (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 ujicoba 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 katagori 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 students' critical thinking skills include interpretation, analysis, evaluation and inference. This study is a Research and Development by using method analysis, desaign, development, implementation and evaluation (ADDIE). Validation expert was conducted with the expert test related to format, content/material, and language. The instrument was used on the collection data are documentation, validation sheets, observation sheets, and test. The result of the instrument in the junior high school class VII Bustanul Ulum Panti Jember shows that the critical thinking skills of student was improved due to the data from test and observation According to the indicator of critical thinking skills, the n-gain values of was obtained around 0.47, means moderate interpretation. The conclusions of this research shows that the learning instruments of science based on local wisdom was developed in valid category so it is quite effective in improving students' critical thinking skills.

Key words: *Critical Thinking, Learning Instrument, Science.*

INTRODUCTION

The related policy about inserting local wisdom program in content standard from a curriculum and underlied reality that Indonesia has cultural diversity. So the content standard in implementation Kurikulum Tingkat Satuan

endidikan (KTSP) stated that science learning in junior high school must refer to each area of local wisdom (Ridwan, 2007). It is because local wisdom is the basic to take policy on local level in health, agriculture, education, natural resource management and society activity (Tiezzi *et al*. 2007).

But fact shows that many young generations about local wisdom in their area. Even though local wisdom contains also cultural local wosdom. Cultural local wisdom is local knowledge that has fused with belief system, norm, culture and expressed in tradition and myth embracced in long term time (Rusilowati *et al*. 2012). Thus, each teaching lesson material needs to integrat environment and local wisdom, so it cant maintain local wisdom and keep environment. Through understanding on local wisdom, the harmony relation between human and environment can be tied.

Based on observation shows that all schools that has been observed hasn't done KTSP demand well. The teacher still use learning instruments composed by government (Ministry of education) that actually those are only sample. Many science teachers still dependent on classical way in teaching where the teacher is only learning source (teacher centered*)*. The students are not introduced about the nature of science holistically. So the students only memorize concept without improving critical thinking skills on solving the problems around them. The nature of learn science was not enough to only memorizing and understanding scientists' invention. Problem solving is the main aim of learning science (Korsunsky, 2004). Thus it is needed to conduct a development of learning instruments that can introduce and train the students' skills on the nature of learning science.

The problem solving of those problems is through developing natural science learning instruments based on local wisdom. These learning instruments also adapted with the condition of students around. The expectation is to help science teachers to teach their students. Another results expected from developing these learning instruments is to improve students critical thinking skills.

There are some bases to develop science learning process i.e observe, measure, experiment and processing data (Hodosyova, 2015). Those bases must be trained begin from students of primary school until secondary school. As supporting for science learning activity is needed thinking skill in science process. Deta *et al*. (2013) stated that there was interaction among learning method, creativity and students' science process skills. Based on that statement it is needed to make science learning process activity to improve thinking skills.

Thus thinking skills are needed in science learning. One of them are critical thinking skills (Budiman *et al*. 2008). The limitation of Indonesian students' critical thinking skills caused the result of science literacy conducted by TIMSS was in place 40 from 42 countries (TIMSS & PIRLS International Study Center, 2012). This reality is supported by the implementation of science learning cannot give contextual phenomena in science learning. The instructional model is teacher centered. The one way activity was dominant in learning activity so the students are inclined pasive and there was not thinking process well.

To solve those problems, the learning process in the school hopely also train students to think. Teaching critical thinking is important because through critical thinking, the students will be trained to observe, make question, make hyphotheses, make observation and collect data, then give conclusion. Ciritcal thinking also trains the students to think logic 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 theoretical and less of improving critical thinking skills. Students' enthuastic 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 students' critical thinking skill in the junior high school class VII Bustanul Ulum Panti Jember.

METHOD

This study is research and development (R&D) with methodology ADDIE (Analysis, Desaign, Development, Implement and Evaluate).

On Analysis step is conducted survet to document students' condition who has low critical thinking skills and then make goal setting to improve students' critical thinking skills. On *Design step is* determination of indicator in critical thinking, determination of learning material and making of natural science learning instruments based on local wisdom including textbook, student worksheet, syllabus and lesson plan. The next step is Development, conducted packaging activity about natural science learning instruments based on local wisdom. It is laso conducted 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 will be created science learning instruments based on local wisdom that has validity valid so it is ready to be implemented.

The product that has been revised will be ready to be conducted implementation 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 junior high school class VII Bustanul Ulum Panti Jember. It was conducted with one shot case study through rely on from pre test dan post test. Based on pre test, implementation, and post test so it was conducted normal gain test with equation 1.

$$g = \frac{Xm - Xn}{100 - Xn} \quad \text{.....(1)}$$

With
g = gain value
Xm = post test value
Xn = pre test value

To interpret gain value is used guide on Table 1.

Table 1. Interpretation of N gain value

N gain value	Interpretation
g ≥ 0.7	**High**
0,7 > g ≥ 0.3	**Moderate**
g < 0.3	**Low**

Location of Research

Bustanul Ulum Panti Jember was chosen as location test because it is located in Panti specially Kemiri Kali Kepuh Gunung Pasang Jember, where that area is coffee estate which 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 abot coffee,but they don't know the history, benefit and what substance of coffee. It is unfortunately because the students who live in coffee estate don't know about the condition around them.

Therefore to support students' understanding about coffee in the area, so in science subject is developed learning instrument based local wisdom which very necessary by students to add the wide knowledge about the coffee.

Instruments of Research

Instruments of research in this study are Format of learning formulation each subject contain/material with critical thinking skills indicator. Format of judgement for science education experts. Test for assessing critical thinking skills. Questionnaire to measure the students and teacher's difficulties in using instruments. Format of observation form of students' critical thinking skills in doing experiment. Interview guideline to complete data from questionnaire and observation.

RESULT AND DISCUSSION

Developing Learning Instruments

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, those are validated by expert judgment.

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

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

Environment in local wisdom each place in Indonesia should be explored and done as unity in Indonesian people **(**Malau, 2013**).** Many 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 students' 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 coffee estate.

Learning Instruments Implementation

On implement step was conducted 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 and students' response related to use of The result of the science learning instrument based on the local wisdom by expert judgment as showns in Table 2.

Table 2. The result of experts validation on science learning instruments based on local wisdom.

Nu	Learning Instruments	Total Score	Aver age	Cate gory
1	Content/Material	105	4,20	Valid
2	Format	108	4,32	Valid
3	Language	109	4,36	Valid

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

Based on Table 2 shows that the result of questionnaire assessment by experts from content/material got score 4.20. This score was got from the average of validation score, where total score of validation got 105 then divided to the total of statement aspects that amount 25, science learning instruments based on local wisdom from content/material got 4.20. While format got 4.32 language got 4,36. science learning instruments based on local wisdom is valid if total score above or equal with 4,00 and less valid if getting below or 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 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 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.

Nu	Instruments	Total Score	%	Category
1	Syllabus	19	76	Good
2	Lesson Plan	19	76	Good
3	Textbook	20	80	Very Good
4	Student Worksheet	21	84	Very Good
	Average		79	Good

Based on 25 students class VII 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 response on the science learning instruments based on local wisdom as shown in Table 4.

Table 4. The result of students' response about science learning instruments based on local wisdom.

Nu	Learning Instruments	Total of Student s	Perc enta ge	Category
1	Student book	18	72	Good and very good
2	Student worksheet	21	84	Good and very good

Critical Thinking Skills

In this research besides validation of science learning instruments based on local wisdom, also expected to improve students' critical

thinking skills, because many people think that somebody has critical thinking skills if we can debate in public. though, critical thinking has meaning wider than that. Arnyana (2008) Reported that critical thinking was skill to solve the problem faced. While Ibrahim (2008) stated that critical thinking is skill to do knowledge investigation or something believed based on supported fact. Critical thinking is defined as reflective thinking and reasonable to decide what is believed or done. On Bloom's taxonomy, Cognitive dhomain as critical thinking definition is synthesis, analysis, and evaluation. Based 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.

On evaluate step was conducted analyzing critical thinking skills i.e. determining process indicator of students' critical thinking skills in science learning that would be improved. The determination of indicator was based on literature review related critical thinking skills Table 5 Shows the information on development and activity indicator of the student critical thinking skills has been done on the learning process.

Table 5. Indicator and students' critical thinking activity

Indicator	Activity
Interpret	Compare various, criteria, regulation or procedure in getting data
Analyze	Identify actual proofs and connecting among concepts
Evaluate	Assess credibility of questionand descrption
Inference	Account the statement based on element need related to concludethe problems

After conducting good preparation in Design and Development step so it was implemented to 25 students of class VII SMP 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 students' skill in interpretation and evaluation get 0.46. If compared with indicator of another skills inference is the lowest i.e. 0,44. Looked from all indicators so those gets average N gain 0.47 with moderate interpretation.

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

Indicator	N	Xn	Xm	N gain
Interpret	25	60.5	78.8	0.46
Analyze	25	62.3	82.3	0.53
Evaluate	25	63.6	80.3	0.46
Inference	25	60.2	77.7	0.44
N gain average				0.47

The result of critical thinking skills have significant compared using science learning instruments based on local wisdom in this research. It is caused the change of learning instruments can improve the students' critical thinking skills, especially on classify, assume, predict, hypothesize, analyze, conclude, and evaluate This result similar to the other researcher (Susanti, 2012) developing practicum guideline of genetics could train students' critical thinking skills Further, Hassoubah was reported that people who think critically will evaluate and then conclude something based on fact to make decision. So one of characteristics people 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 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 proof, asumption, logical and language underlie 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 (Helpern, 2012). This statement gives that critical thinking skills begin with doing analysis process of case then gives idea related to proof and the end is able to take 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 developing students' critical thinking skills Popil (2011) was reported that the giving some case on the study are effective method to promote on the facilitation of active learning, helping clinical problems and to encourage students' critical thinking skills. Through that case study the students will begin to compare data invention, make invention relation, make argument and look at the problems back till make decision.

CONCLUSION

Based on the results can be concluded that science learning instruments based on local wisdom has been valid and reasonable to be used in junior high school because getting value 4.20, 4.32, and 4.36 from expert validasi. Besides that science learning instruments based on local wisdom has been developed also can improve students' 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 can be done are integration of local wisdom in lesson content/material, developing test, developing textbook, and developing instructional model.

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