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# The effectiveness of madurese culture wisdom on science learning sound material in primary school students' critical thinking skills

H F Wirawan<sup>1,2\*</sup>, Suratno<sup>3</sup>, Suparti<sup>2</sup>, Dafik<sup>4</sup> and Hobri<sup>4</sup>

<sup>1</sup>SDN 5 Patokan, Situbondo, Indonesia

<sup>2</sup>Universitas Terbuka, Jember, Indonesia

<sup>3</sup>Department of Biology Education, University of Jember, Indonesia

<sup>4</sup>Department of Mathematic Education, University of Jember, Indonesia

\*Email: hendriferryw@gmail.com

**Abstract.** Lack of insertion or understanding of local culture and traditions in classroom learning will cause students to appreciate the existing culture and grow in their environment. This research is a development research. The stages that has been through to make a valid, practical, and effective calculus learning tool are: 1) defining stage, 2) planning stage, and 3) developing stage. Trials that had been done are expert trials / expert validation, limited trials, and field trials. Field trials were conducted at SD Negeri 5 Patokan in two classes, 4A and 4B class. The research instruments were validation sheet, teacher's evaluation sheet, student's evaluation sheet, observation sheet for learning implementation, test of learning outcomes, and questionnaire for independence student's learning. Validation and practicality data analysis are done by converting quantitative data in the form of an assessment score into qualitative data in the form of a standard scale of five. Analysis of effectiveness data is done by determining the percentage of mastery learning and student learning independence. Validity and practicality are shown by the results of expert validation which show a value of 4.46; while the effectiveness of learning is indicated by calculating the normal gain which shows 48.8% students get an effective score; character values in students show good categories, and student responses to learning are positive with 96% of students assessing positively towards the implementation of learning. It can be concluded that 1) developing science teaching materials based on Madura culture (sound material) for class 4 belongs to valid category, 2) developing science teaching materials based on Madura culture (sound material) for class 4 belongs to practical category and 3) developing science teaching materials based on Madura culture (sound material) for class 4 belongs to effective category.

## 1. Introduction

Teaching material in the form of student books is still lacking in further development. Students only have textbooks in the form of textbooks from the government but need further development of teaching materials and are still considered difficult by students because the language presented is not in accordance with the conditions of the Situbondo area. Students in SD Negeri 5 Patokan, the majority of whom use Madura language to communicate with their friends. So that every time learning is difficult to understand the teacher can apply to the real world of students in communicating with parents and surrounding areas. The Madurese Culture Wisdom needs to be maintained and inserted in every learning with the aim of students understanding the material.

In fact, incorporating cultural elements into the world of education is still a rare thing. If viewed from the science education, almost all the contexts contained in the science material are general. In



addition, according to Astutik, in his research stated that in the learning process in the classroom, many teachers encountered that did not utilize the environment especially the local wisdom of the local community in the development of learning tools [14]. Lack of inclusion or understanding of local culture and traditions in classroom learning will cause students to lack respect for the culture that exists and grow in the environment around them [14]. In fact, incorporating cultural elements into the world of education is still a rare thing. If viewed from the science education, almost all the contexts contained in the science material are general. In addition, according to Astutik, in his research stated that in the learning process in the classroom, many teachers encountered that did not take advantage of the environment especially the local wisdom of the local community in the development of learning tools [14]. Lack of insertion or understanding of local culture and traditions in classroom learning will cause students to lack respect for the culture that exists and grow in the environment around them [14]. The formulation of the problem in this research is

1. How to develop science learning tools based on local wisdom of Madura culture in class 4 sound material in improving critical thinking skills can be valid?
2. How to develop science learning tools based on local wisdom of Madurese culture in class 4 sound material in improving practical critical thinking skills?
3. How to develop science learning tools based on local wisdom of Madura culture in class 4 sound material in improving critical thinking skills can be effective?

The research objectives are:

1. To analyze the validity of the development of science learning tools based on local wisdom of Madurese culture, grade 4 sound material in improving critical thinking skills.
2. To describe the practicality of developing science learning tools based on local wisdom of Madurese culture, grade 4 sound material in improving critical thinking skills

## 2. Literature Review

Natural science as a scientific discipline and its application in society makes science education important. The cognitive structure of children cannot be compared with the cognitive structure of scientists. They need to be trained and given the opportunity to gain skills and be able to think and act scientifically. Usman Samatowa argues that elementary school students aged 7 to 11 or 12 years are included in the concrete operational stages, where at this stage the child develops logical thinking, but is still very attached to perceptual facts, meaning the child is able to think logically, but it is still limited to concrete objects, and capable of conservation.

According to Maslichah Asy'ari (2006:37), learning science requires direct interaction between students and objects or nature. Students can observe and understand science objects if the teacher as a facilitator creates conditions and provides tools so that students will be able to find concepts and build them in their cognitive structures. Nur and Wikandari [17] argue that the teaching and learning process of science should be more emphasized in the process skills approach, so students can find facts, develop concepts, theories and scientific attitudes that can positively influence the quality of the process and educational products. It is necessary to develop a science learning model that actively involves students in learning activities to find or implement their own ideas. Usman Samatowa (2006) said that learning through direct experience (learning by doing) is a learning model that is suitable for Indonesian children because this learning model strengthens children's memory and is very inexpensive because it uses learning tools and media in the environment own children. Quoted by Tisno Hadisubroto in his book *Elementary School Science Learning*, Piaget said direct experience plays an important role as a driver of the cognitive development of children. Thinking is an activity that is always done by humans, even when they are asleep. For the brain, thinking and solving problems is the most important work, even with unlimited abilities. Thinking is one of the main strengths and is a characteristic that distinguishes humans from animals. According to Sardiman thinking is a mental activity to be able to formulate understanding, synthesize, and draw conclusions [13]. Ngalim Purwanto argues that thinking is an activeness of the human person which results in findings directed towards a goal [8]. Humans think to find the understanding / understanding

they want. Santrock also expressed his opinion that thinking is manipulating or managing and transforming information in memory[11]. Thinking is often done to form concepts, reason and think critically, make decisions, think creatively, and solve problems.3. To describe the effectiveness of science learning tools based on local wisdom Madura culture of sound material grade 4 in improving critical thinking skills

Thinking is part of the activities that are always done by the brain to organize information to achieve a goal, then critical thinking is part of the thinking activities that are also carried out by the brain. According to Santrock[11], critical thinking is reflective and productive thinking, and involves evaluating evidence. Jensen argues that critical thinking means an effective and reliable mental process, used in the pursuit of relevant and true knowledge about the world[4]. CeceWijaya also expresses his ideas about the ability to think critically, namely the activity of analyzing ideas or ideas in a more specific direction, distinguishing them sharply, choosing, identifying, studying and developing them in a more perfect direction[21]. Based on these expert opinions, a conclusion can be drawn about the understanding of critical thinking abilities, which is the ability that everyone has to analyze ideas or ideas in a more specific direction to pursue relevant knowledge about the world by evaluating evidence. The ability to think critically is needed to analyze a problem to the stage of finding a solution to solve the problem. People who have the ability to think critically don't just know an answer. They will try to develop other possible answers based on analysis and information that has been obtained from a problem. Critical thinking means doing the process of reasoning about a problem to the complex stage of the "why" and "how" the process of solving it. According to Sapriya the purpose of critical thinking is to test an opinion or an idea, including making a judgment or thought based on the proposed opinion [12]. These considerations are usually supported by criteria that can be accounted for. The ability to think critically can encourage students to come up with new ideas or thoughts about problems about the world. Students will be trained on how to select various opinions, so they can distinguish which opinions are relevant and not relevant, which opinions are true and not true. Developing students' critical thinking skills can help students make conclusions by considering data and facts that occur in the field. Local wisdom is the identity or cultural personality of a nation that causes the nation to be able to absorb, even cultivate cultures that come from outside / other nations into Wibowo's own character and abilities [20]. These identities and personalities naturally adjust to the viewpoints of the surrounding community so that values do not occur. Local wisdom is one of the means in cultivating culture and defending yourself from unfamiliar foreign cultures. Local wisdom is a view of life and science as well as a variety of life strategies in the form of activities carried out by local communities in answering various problems in meeting their needs. In foreign languages, it is often conceptualized as local wisdom, local wisdom or local knowledge, local geniusFajarini [1]. Various strategies carried out by the local community to maintain its culture. A similar sentiment was also expressed by Alfian Local wisdom is interpreted as a way of life and knowledge and as a life strategy in the form of activities carried out by local communities in meeting their needs. Based on Alfian's opinion [10], it can be interpreted that local wisdom is a custom and tradition that has been carried out by a group of people for generations that up to now has been maintained by certain indigenous peoples in certain areas.

Based on the above understanding it can be interpreted that local wisdom (local wisdom) can be understood as local ideas that are local wise, full of wisdom, good value, which is embedded and followed by members of the community. Furthermore Istiawati holds that local wisdom is the way people behave and act in response to changes in the physical and cultural environment [3]. A conceptual idea that lives in society, grows and develops continuously in the community's awareness from the nature related to the life of the sacred to the profane (the everyday part of life and its nature is mediocre). Local wisdom can be understood as local ideas that are wise, full of wisdom, of good value, embedded and followed by members of the community. Local wisdom according to Ratnais a binding cement in the form of culture that already exists so that it is based on existence [9]. Local wisdom can be defined as a culture created by local actors through an iterative process, through internalization and interpretation of religious and cultural teachings that are socialized in the form of norms and used as

guidelines in people's daily lives. Based on the opinions of the experts above, researchers can take the red thread that local wisdom is an idea that arises and develops continuously in a society in the form of customs, rules / norms, culture, language, beliefs, and daily habits. Haryanto states that forms of local wisdom are a diversity of harmony in the form of social practice based on a wisdom from culture [2]. Forms of local wisdom in society can be in the form of culture (values, norms, ethics, beliefs, customs, customary law, and special rules). Noble values related to local wisdom include love for God, the nature of the semester and its contents, responsibility, discipline, and independence, honesty, respect and courtesy, love and care, confidence, creativity, hard work, and never give up, justice and leadership, kind and humble, tolerance, peace, and unity. Almost the same thing was stated by Wahyudi states local wisdom is an unwritten rules that become a reference for society which covers all aspects of life, in the form of rules relating to relationships between humans [19], for example in social interactions both between individuals and groups, related with hierarchy in governance and custom, rules of inter-clan marriage, karma in daily life

### 3. Research Methods

In this study researchers used research and development methods or better known as Research and Development. Research and Development Methods are research methods used to produce certain products, and test the effectiveness of these products [15]. According to Puslitjaknov (Nusa Putra, 2011: 133) the development model is the basis for developing products to be produced. Development models can be in the form of procedural models, conceptual models, and theoretical models. In this research, the procedural model is used because it is considered suitable with the development goals to be achieved, namely to produce a product and test the feasibility of the products produced, where to achieve these objectives must go through certain steps that must be followed to produce certain products. This research was conducted at SDN 5 Patokan Situbondo. The study was conducted for approximately 1 year, from February 2019 to January 2020. The study involved grade 3 students as representatives of the low class and grade 4 students to represent the high class. Data collection procedures used in this study were interviews, questionnaires, observations and documents. This research uses qualitative and quantitative data types, therefore the data are analyzed statistically descriptive. Qualitative data is presented in the form of descriptions obtained based on various input from supervisors, expert advisers, students and teachers about learning tools. Quantitative data is presented in the form of numerical symbols or numbers which are then calculated to obtain a generally accepted conclusion. The data analyzed in the study are as follows:

#### 3.1. Analysis of the validity of Learning Media data

The quality of learning media developed is determined based on the results of the validation carried out by experts. The validated component is a learning device. Each component has a maximum score of 20, so the maximum score of the four components is 80. Based on the maximum score obtained, the quality of learning media can be expressed using the formula:  $\text{Value} = \frac{x}{80} \times 100$

Based on the formula, the criteria values obtained are as follows:

**Table 1.** Conversion Criteria Value of learning devices [5]

| Value            | Criteria Value of learning devices |
|------------------|------------------------------------|
| Score < 50       | Poor Valid                         |
| 50 < Score < 70  | Enough Valid                       |
| 70 < Score < 90  | Valid                              |
| 90 < Score < 100 | Less Valid                         |

### 3.2. Analysis of the Feasibility of Learning Media for Students

Learning media procedures made using science-based learning media in accordance with Madurese Culture Wisdom were analyzed using descriptive statistics using classical scores or average values. Analysis of students' thinking skills was tested using tests with a total of 20 items. The maximum score of each item is 10 while the minimum score is 0. The scores obtained are then categorized according to student achievement according to Arikunto. The categorization is as follows:

**Table 2.** Analysis of Students' higher-order thinking skills

| Percentage (%) | Category     |
|----------------|--------------|
| 76 – 100       | Very decent  |
| 56 – 75        | Worthy       |
| 40 – 55        | Fair enough  |
| 0 – 39         | Not Eligible |

The category of high-level thinking skills of these students is obtained based on the following formula:

$$S = \frac{\sum c_i}{\sum s_i} \times 100$$

### 3.3. Analysis of Effectiveness Using Learning Media

Analysis of student responses to the use of learning strategies used were analyzed using a questionnaire. The questionnaire uses a Likert scale with 20 statements. So the maximum score obtained from each statement on the questionnaire is 4 and the minimum score is 1. Therefore a table based on the percentage as follows:

**Table 3.** Analysis of Effectiveness in Using Science teaching materials according to Madurese Cultural Wisdom

| Percentage | Category          |
|------------|-------------------|
| 0 % – 24%  | Strongly Disagree |
| 25% – 49 % | Disagree          |
| 50% – 74 % | Agree             |
| 75% – 100% | Strongly agree    |

(Nurkencana&Sunartana 1990)

### 3.4. Analysis of the results of the interview

Various data obtained from the interviews were analyzed in the description. The analysis is described based on each of the answer points raised at the interview. Data obtained from the results of interviews are used as secondary data.

## 4. Research Result

Developing science learning tools based on local wisdom of Madurese culture, grade 4 sound material in improving critical thinking skills can be valid. This step is carried out a preliminary study, examines the ability of beginning to end students, student analysis, assignments, material and learning objectives. Following is an explanation of each stage of definition:

#### 4.1 Preliminary Study

The background of developing science learning tools based on local Madurese wisdom was made as a preliminary study to produce initial problems. Literature study is the initial result of a preliminary study which includes gathering information in order to support research development of learning tools based on local wisdom of Madura, studying articles or reports on research results related to development products. Observing learning activities and interviews directly with science teachers is a technique of field study. The low critical thinking skills of students is a problem faced in the science learning process. The importance of character according to the 2013 Curriculum makes it difficult for teachers to make learning tools that are ideal for students' circumstances. The ideal material with local Madurese wisdom is Bunyi, this reason is supported from the results of analysis of field studies and literature.

#### 4.2 Student Analysis

Knowing the characteristics of students in accordance with science learning tools based on local Madura wisdom as a source of learning. Interviews with science teachers are activities in the analysis of students. The test subjects are SD Negeri 5 Patokan.

#### 4.3 Framework Analysis

Student Knowledge Sound material and its application have been learned by students while sitting in class 3 so that this material is not new material for students.

#### 4.4 Analysis of Student Cognitive Development

4th grade elementary school students serve as research subjects. Learning by involving local wisdom Madura with Sound makes students more excited to explore science in activities. The average student's academic ability is the same

#### 4.5 Task Analysis

Core Competencies (KI) and Basic Competencies (KD) are a reference in designing task analysis that will be developed on learning tools.

#### 4.6 Learning Objective Specifications

Coherence between the results of task analysis and concept analysis will refer to the formulation of learning objectives. The learning objectives are formulated as follows:

- a) After exploration, students are able to explain how to produce sounds from various objects around completely.
- b) After exploration and discussion, students are able to present observational reports on how to produce sounds from various objects around them systematically

#### 4.7 Practical development of natural science learning tools based on local wisdom of Madurese culture in class 4 sound material in improving critical thinking skills

##### 4.7.1 Expert Validation

The validator or expert lecturer gives an assessment of the assessment instrument before the instrument is used in learning. At the validation stage by expert lecturers, input and criticism will be obtained as a reference in revising the instruments developed. The validation instrument assessment conducted by the validator is generally declared valid with a revision and can be applied to learning. Table 4 contains the results of the validation of the assessment instruments.

**Table 4.** Results of Validation of Valuation Instruments

| No | Retrieval Instrument                                | Validation Data | Note  |
|----|---|-----------------|---|
| 1. | RPP Assessment Sheet                                | Valid           | Formulation of learning objectives, determination and composition of materials, media, learning resources and learning evaluation in accordance with the format of the lesson plan and the essence of the lesson plan                               |
| 2. | Students Paperwork Assessment Sheet                 | Valid           | The students paperwork pattern and students paperwork contents are in accordance with the elements in the students paperwork assessment sheet, which are didactic, construction, appearance and linguistic aspects.                                 |
| 3. | Simulation Media                                    | Valid           | The format of the simulation and the substance of the simulation are in accordance with the direction of the evaluation on the simulation assessment sheet, namely material, illustrations, quality and appearance of the media, and attractiveness |
| 4. | Critical Thinking Skills Test Assessment Sheet      | Valid           | Format questions and essences about critical thinking skills are in accordance with the indicators on the question assessment sheet namely material, construction, and language.  |
| 5. | Questionnaire Assessment Sheet and Student Response | Valid           | The questionnaire and student response format is in accordance with the aspects in the questionnaire assessment sheet and student responses, namely content, construction and language.   |

Critics and suggestions from the validator on the learning instrument assessment instrument are:

- 1) Students paperwork  
Re-check the equation used for activity sheet three
- 2) Questions of critical thinking skills  
Match the sentence questions with indicators of critical thinking skills
- 3) Student Response Questionnaire  
Pay attention to the language used for students
- 4) Validity and Reliability Assessment Instruments  
The validity and reliability assessment instruments were obtained after expert lecturers and science subject teachers assessed the learning tools and filled in the assessment sheets that were available.

#### 4.7.2 Rating result

Learning Tools There are 3 expert lecturers evaluating this learning tool. The purpose of this assessment is to obtain an appropriate learning tool. Table 5 lists the reviewers in the assessment of learning tools.



**Table 5.** Name of Reviewer

| No | Validator's Name              | Note                             |
|----|-------------------------------|----------------------------------|
| 1. | Hj. Ririn Yunaini, S.Pd, M.Pd | Supervisor of Situbondo District |
| 2. | Sunyoto, S.Pd, M.Pd           | Headmaster                       |
| 3. | Rahmat Hidayat, S.Pd, M.Pd    | Elementary Teacher               |

The learning tool developed was validated by experts in order to get written and oral criticisms and suggestions. Learning tools and assessment sheets are submitted to expert lecturers and grade 4 teachers to be evaluated by expert lecturers and class teachers.

#### 4.7.3 RPP Assessment Results

The purpose of the RPP assessment is to determine the implementation of reflections on the wisdom-based location of Madura culture. The aspects of RPP assessment include, aspects of the formulation of learning objectives, aspects of the selection and construction of teaching materials, aspects of selecting learning resources / learning media, aspects of steps / learning activities and aspects of evaluating learning outcomes.

The results of the complete assessment of the RPP by the validator. Based on the conversion table of the RPP assessment score, it can be concluded that the RPP based on local wisdom based on Madura based on local wisdom Madura gets a score with a very good category for all aspects. Suggestions and criticisms provided by the validator of the developed lesson plans are: (1) The teaching materials are adjusted to the local wisdom used. 2) students paperwork Assessment Results Improvement of students' critical thinking skills is used as a reference in assessing students paperwork on sound material based on local Madurese wisdom. The objective of the students paperwork assessment is to find out the feasibility of the worksheet used for learning based on Madura's local wisdom. The assessment aspects of the worksheet include the didactic, construction, and display aspects.

#### 4.7.4 Effectiveness of science learning tools based on local wisdom Madura culture of sound material grade 4 in improving critical thinking skills

The first step taken during a field trial is to provide a pre-test containing an instrument to measure the initial abilities of the two classes. The second stage is the implementation of the learning process with the same time allocation of 9 JP. The experimental class uses learning tools based on local Madura wisdom while the control class uses learning tools commonly used by teachers. The third stage is that students are given post-tests in the form of critical thinking skills and questionnaires. The results of the field trials are explained as follows:

##### a. Observation Results of Learning Implementation

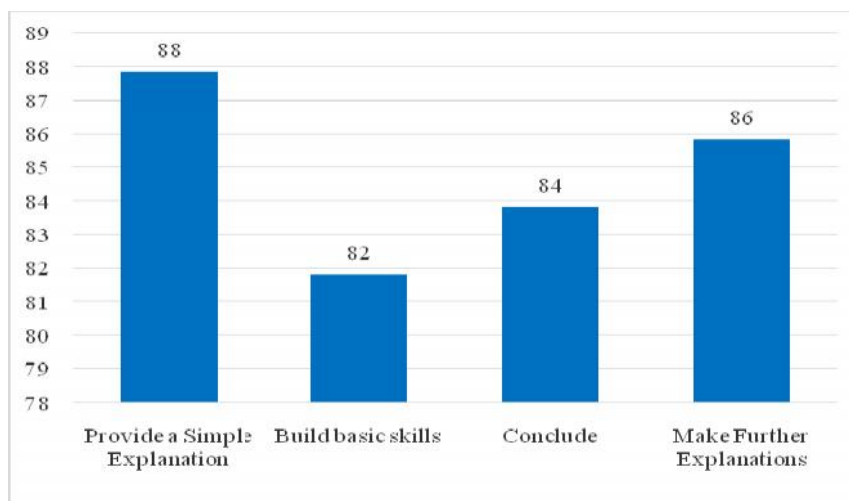
Learning tools are assessed at the field trial stage which is reviewed based on the learning practices implemented in the classroom. The goal is to find out the scope of learning in the classroom through observation. The aspects reviewed are preliminary activities, core and closing activities. Discussion of sound material using the first meeting lesson plan was carried out with a percentage of 78% in the good category. Then the second meeting about sound characteristics reaches a percentage of 89% and the last meeting with a percentage of 94% so that the percentage of RPP reaches 87%

##### b. Student Critical Thinking Skill Test Result Data

The results of observations of critical thinking skills can be seen in table 4.6 as follows:

**Table 6.** Students' critical thinking abilities Meeting1

| No   | Indicator                    | Number of Students a Get a score |    |    | %   |
|--|------------------------------|----------------------------------|----|----|-----|
|  |                              | 1                                | 2  | 3  |     |
| 1  | Provide a Simple Explanation | 3                                | 6  | 24 | 88% |
| 2  | Build basic skills           | 4                                | 10 | 19 | 82% |
| 3  | Conclude                     | 2                                | 12 | 19 | 84% |
| 4  | Make Further Explanations    | 2                                | 10 | 21 | 86% |
| Total percentage of critical thinking skills |                              |                                  |    |    | 85% |

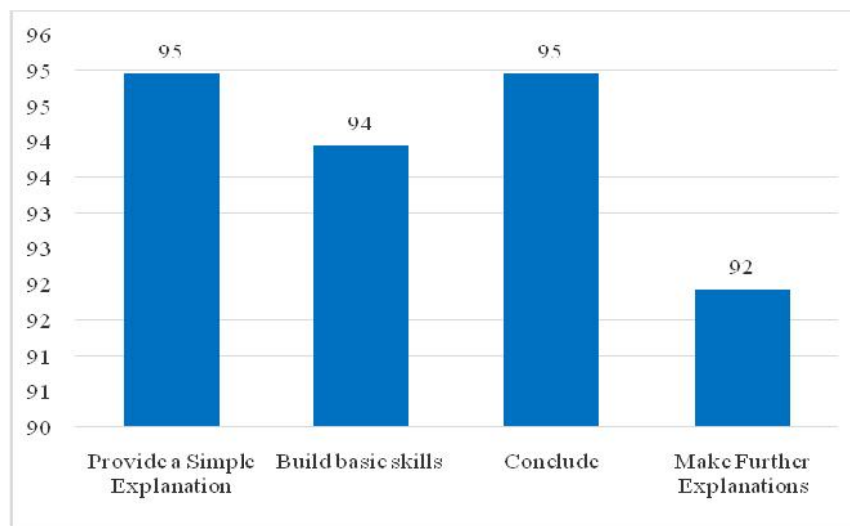
**Figure 1.** Students' critical thinking skills

Based on table 6 above, students' critical thinking skills have increased from active to very active categories with a percentage of 85% (after consultation with table 5). From the 4 aspects observed, it appears that providing a simple explanation is more active than other aspects, reaching 88%. There are more than half of the students who have the ability to give simple, very active explanations, that is 24 people and only one student who has not been able to explain due to being busy with the homework of other subjects, as well as enough on science subjects.

Building basic skills in class is also classified as very active there are 19 students for a score of 3, with a percentage of 82%. there are students who score very low that is and are low in aspects of building basic skills because students do not want to try to collaborate with friends. There are 10 people classified as active to score 2 places of learning. Summing up is classified as very active, as evidenced by the acquisition of a percentage on that aspect that is equal to 88%. Students who have concluded are quite dominant as many as 23 people, and there are only 10 people who have active observation activities in doing the assignments given by the teacher. A low score of 1 does not show any student who is unable to draw conclusions based on the results of the discussion.

**Table 7.** Students' critical thinking abilities Meeting 2

| No   | Indicator                    | Number of Students a Get a score |    |    | %   |
|--|------------------------------|----------------------------------|----|----|-----|
|  |                              | 1                                | 2  | 3  |     |
| 1  | Provide a Simple Explanation | 3                                | 6  | 24 | 88% |
| 2  | Build basic skills           | 4                                | 7  | 22 | 85% |
| 3  | Conclude                     | 2                                | 11 | 20 | 85% |
| 4  | Make Further Explanations    | 2                                | 10 | 21 | 86% |
| Total percentage of critical thinking skills |                              |                                  |    |    | 86% |

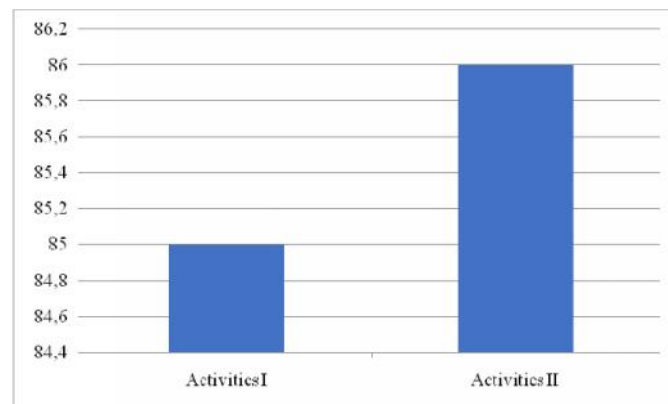
**Figure 2.** Students' critical thinking abilities Meeting 2

Making Further Explanations is classified as active, it is evident that there are 18 students getting a percentage in that aspect which is equal to 84% active and there are 2 students who get a low score of score 2. It also occurs in the Making Further Explanation aspects. Making Further Explanations given to students at the time of the presentation were classified as active at a percentage of 84%. students are able to make Further Explanations based on their experience students are able to describe in their own words based on the pictures shown by the teacher so that students are able to provide opinions through observation activities. The observation results showed a change in students' critical thinking skills after the first meeting and the second meeting. The results of observations made can be recapitulated as follows:

**Table 8.** Recapitulation of Observation Results Meeting 1 and 2

| Activities    | Success Category |     |        |        |            |
|---------------|------------------|-----|--------|--------|------------|
|               | Very low         | Low | Enough | Active | LessActive |
| Activities I  | -                | -   | -      | -      | 85%        |
| Activities II | -                | -   | -      | -      | 86%        |

Source: Processed observation data



**Figure 3.**Recapitulation of Observation Results Meeting 1 and 2

Based on the data above, it appears that there is a change in the level of critical thinking skills of students in grade 4 meeting 1 and 2, that is, increasing from active to very active categories. This is indicated by the percentage of students' critical thinking skills grade 4 at the first meeting by 85% to 86% the second meeting. Active low critical thinking skills of grade 4 students can be seen from the mastery of learning both individually and classically.

## 5 Discussion

Developing science learning tools based on local wisdom Madura culture of sound material grade 4 in improving critical thinking skills can be valid reaching a percentage of up to 91% with the category of very valid Learning Implementation Plan (RPP) in this study made into two meetings. The first lesson plan is about the basic form of comparison, which is the comparison of two quantities that are similar or not similar based on local Madurese wisdom. The second lesson plan is about comparative material worth and reversing values based on Madura's local wisdom. The lesson plan is used as a teacher's guide in implementing the learning process for students for each meeting. The composition of the RPP compiled are: (1) school identity; (2) subject identity; (3) Material; (4) Class / semester; (5) time allocation, (6) core competencies; (7) Basic competencies, learning activities, and indicators of competency achievement; (8) learning objectives; (9) learning material; (10) learning models and methods; (11) learning resources, (12) learning media; and (13) learning steps.

In compiling the steps of learning, researchers use Madura-based local wisdom development which consists of 6 stages, namely: (1) stimulation; (2) states the problem; (3) data collection; (4) data processing; (5) verification; and (6) interesting conclusions. Student Worksheets are used to support the implementation of learning as arranged in the lesson plan. Since the RPP was developed into two meetings, the students paperwork will also be developed into two meetings.

The first students paperwork guides students to be able to compare two quantities with similar or unequal units. The amount uses the local unit of local Madura wisdom in conducting activities. The second students paperwork requires students to solve problems regarding the comparison of values or reversals based on data obtained through the data collection process.

The data collection process was carried out through interviews with Madura local wisdom using pre-learning instruments. This data collection is done outside of school hours so that it is hoped that in this way, students can find a form of mathematics in Madura's local wisdom activities. Expert judgment was conducted to evaluate the device developed for use in the pilot phase. If the learning device is not yet valid, then validation will continue until a valid learning device is obtained. The device is evaluated by experts (validators) regarding content provisions, learning material, conformity to learning objectives, physical design, and others. This phase is carried out for one week by validators who have the capacity and competence regarding the development of science learning tools.

Validators are expected to be able to provide input or suggestions to improve learning tools that have been developed by researchers.

Developing science learning tools based on local wisdom Madura culture of sound material grade 4 in improving critical thinking skills by practically reaching a percentage of 87% with a very decent category. The use of local culture (ethnic) in Culture-Based Learning is very beneficial for the meaning of the learning process and results, because students get contextual learning experiences and apperception material to understand the concepts of science in local (ethnic) culture. In addition, the model of integrating culture in learning can enrich local culture (ethnic) which in turn can also develop and strengthen national culture which is the culmination of local culture and ethnic culture that develops (Dikti: 2004). With these demands, it is fitting for the Indonesian people to return to their identity through the reinterpretation and reconstruction of their own cultural noble values. One effort to bring back the values of local wisdom to the surface with the target of the nation's next generation can be done with education. In the world of education there is a learning theory delivered by Ausubel (in Thobroni: 2017) which states that learning is meaningful (meaningful learning) if the learning is able to link the things that have been learned in class with real life. Learning in this way must apply contextual learning. Contextual learning is a learning concept that links the material being taught with the real world of students. Students are able to make connections between the knowledge they have and their application in their daily lives (Sagala 2010), one of which is by using local wisdom. Education can not only be done formally by teachers in schools, but students can learn independently with teaching materials developed by teachers that contain noble values in local wisdom that can later build the nation's character (Tanjung: 2015).

The steps that can be taken by the teacher in carrying out science / science learning activities based on local culture as explained (Wahidin: 2006) are as follows: 1) preparing material in accordance with the cultural conditions of the surrounding community that will be observed; 2) make teaching materials that are integrated with local culture to be observed; 3) design learning plans that will be used in harmony with the demands of the learning objectives; 4) the selection of instructional media (video) which requires students to be able to integrate local culture with the concept of learning they learn at school; 5) learning begins by exploring students' initial knowledge of culture which will be integrated in science learning and guiding students to connect their culture to scientific concepts. As mentioned above, that one component of science learning activities is the existence of science teaching materials.

The development of science teaching materials must refer to the criteria established by BSNP (2014) that must include 4 components, namely: the content, presentation, language and graphic components. In the development of science teaching materials, teachers can do creative innovations by adding inquiry activities in them, scientific literacy activities, web-based learning activities (internet), or activities oriented to science process skills. This has become very reasonable among science teachers, because with the development of teaching materials that have such an orientation, teachers understand that the nature of learning science will be achieved. The nature of learning science includes 3 components: product (cognitive), process (psychomotor) and value (affective). However, the achievement of the nature of science learning itself is felt to be insufficient to be the foundation of students to participate in building the nation's character. This is because there is very little teacher's role in internalizing the values of local wisdom according to their own regions in the development of their teaching materials. Though this has become very important to develop student character as a starting point in the development of national character. As the results of research conducted by Maddock (in Wahidin, 2006) found that science education in Papua New Guinea who without regard to their cultural values has given birth to a sense of alienation in students at school.

This is because the teacher seems to have separated them from the traditional culture of the community. Specifically, the higher a person's formal education, the greater the alienation effect of his local culture. From this research it appears how the important role of local wisdom to be paired or internalized in science learning. The urgency of developing science teaching materials that should be based on local wisdom is based on the reality in the field where the environment where a student lives

with one another or one school with another school has a different environment and culture. Thus the development of natural science teaching materials should not only be oriented to the material and skills.

## 6. Conclusion

There are several conclusion from this research

1. Developing science learning tools based on Madura culture (sound material) for grade 4 in improving critical thinking skills can be categorized as valid reaching with percentage up to 91% with a very valid category
2. Developing science learning tools based on Madurese culture (sound material) for grade 4 in improving critical thinking skills can be categorized as practical reaching with percentage up to 87% with a very decent category.
3. Developing science learning tools based on Madura culture (sound material) for grade 4 in improving critical thinking skills can be categorized as effective reaching. Changes in the level of activity from first meeting to the next meeting, the percentage of students' critical thinking skills improve from 85% to 86%

Suggestions developed include:

1. The role of students and their involvement in the learning process increases and is more dominant than the role of the teacher during the learning process.
2. Increasing the character of cooperation between students in one group so that it can help students solve problems.
3. Increased responsive character between students in one group so that it can help students in solving problems.
4. The teacher can make the learning device developed as an alternative learning device in improving critical thinking skills

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