THE DEVELOPMENT OF PROCESS PICTURE-BASED TEXT BOOK TO IMPROVE THE STUDENTS HOTS

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ABSTRACT

This study aims to: (1) create appropriate process picture text book to be used in learning activity in order to improve students' High Order Thinking Skill (HOTS), (2) observe the effectiveness of learning process by using process picture text book, (3)observe the practical of learning by using process picture text book. This study is included into development research. The development procedure adapts the 4D development procedure by the steps: (a) defining step, (b) planning, (c) developing, and (d) publishing. The data collecting instrument is written test to measure the effectiveness of using the textbook in the classroom, students' responses questionnaires and observation sheets dealing with the implementation of learning to measure the practical of text book when implemented in learning in the classroom. The data analysis technique uses normalized gain. This technique is used to analyze the achievement criteria before and after learning. The results of study show that: (1) process picture text book in wave material which is developed is appropriate to be used based on assessing of valid categorical expert by the average score 4.1, (2) the effectiveness of teaching material implementation is categorized high by score 0.83, (3) the practical of teaching material implementation is categorized excellent by text book's score through students' responses questionnaires 3.50. In short, it can be concluded that this teaching material based on process pictures is appropriate and it can be used in learning activity in the classroom and it can improve senior high school students' High Order Thinking Skills (HOTS).

Keywords: *Proses pictured-based text book; HOTS; Effectiveness*

1. INTRODUCTION

Science is a collection of knowledge that organized in a systematic or orderly manner whose use is generally limited to natural phenomena, generally accepted (universal), in the form of a collection of data from observations and experiments (Yulianti & Wiyanto, 2009: 3). Koballa & Chiapetta, (2010: 105) states that physics as part of science is essentially; 1) gathering knowledge (a body of knowledge); 2) ways or ways of thinking (a way of thinking); 3) ways to investigation (a way of investigating) about this universe; 4) interaction with technology and social (it's interaction with technology and society). According to Mundilarto (2010: 3), physics is a science that tries to understand natural rules that are so beautiful and neatly can be described mathematically. Thus physics is one of the natural sciences which describes and explains natural law and its occurrence according to the image of the human mind. Besides that physics is also a study of natural phenomena by using mathematical language and obtained from the results of experiments, research, presentation, and measurement mathematically to obtain facts, concepts, and principles of physics.

Based on the results of field observations in one of the high schools in Jember that has implemented the 2013 curriculum mandating student-centered learning, in reality the learning process of physics in the classroom is still a lack of active student involvement, lack of learning support facilities, teachers who still apply learning methods conventional, as well as some physical material that is abstinent. According to (Serway & Jewett, 2009), one of the

material that is abstract is the wave. This can be seen when demonstrating the wave needs a rope medium to see the wave propagation. When observing ocean waves, what is actually observed is changes in sea level. Waves will not exist without the medium of sea water. Because the wave material is abstract, it is generally difficult for students to learn it (La Jamadin, 2016). Some abstract physical material can cause misconceptions in students, one of the abstract physical material is waves. According to (Pablo, 2016), one of the misconceptions (misconceptions) in wave material is the difficulty of understanding the difference in frequency and wave amplitude. For this reason, a textbook is needed that can make students analyze the events in the wave material so that it helps in understanding the concept well.

An important problem that is often faced by teachers in learning activities is choosing or determining the right textbook in order to help students achieve competence (Nahdiatur, 2013). Textbooks are materials or subject matter arranged systematically, used by teachers and students in the learning process (Pannen in Belawati, 2003: 1.12). Thus textbooks can also replace part of the teacher's role and support individual learning. As the development of science and technology certainly brings considerable changes to education. This can be seen in the increasingly diverse presentation of textbooks used by teachers. But there are still many textbooks that are used by teachers in the classroom that do not provide an overview and process of abstract material physics.

In the era of globalization which was marked by increasingly critical community development with demands for services, quality, and products getting higher. To anticipate the demands of the globalization era, high order thinking skills (HOTS) is needed, education is determined to improve high-quality performance through the learning process with the support of the best systems, materials, and human resources. With this capability, it is expected to be able to compete in the era of globalization (Nuris, 2015). Therefore high school level students in particular, not only must have low level thinking skills - Low Order Thingking Skills (LOTS) which include remember, understand, and apply but must arrive at high-level thinking skills - High Order Thinking Skills (HOTS) which includes the ability to analyze, evaluate, and create (Anderson and Krathwol, 2001: 30).

(Zainuri: 2017) in his scientific work entitled "Development of Worksheets Based on Image Processes of Light Material for Middle School Students", making the worksheets for science learning in which there are pictures of processes compiled systematically supporting science teaching books as an alternative to improve student learning outcomes and easy for students to understand. Based on the results of the validation and limited test of the textbooks made, in general it has been in good category. (Fauzi, 2017) in his scientific work entitled "Development of Physics Student Worksheets to Train High-Level Thinking Ability (HOTS) of High School Students, the results of validation developed to practice high-level thinking skills are material, media and learning feasible with an average scale above 85% which means very good. But the development of process picture-based textbooks on wave material to enhance high-level thinking skills (HOTS) is still not developed.

2. METHODOLOGY

This research was conducted to produce valid process picture based textbooks, to know the practicality of process picture-based textbooks to improve the ability of HOTS students in high school, and to know the effectiveness of process picture-based textbooks to increase the ability of HOTS students in high school. The research subjects in the development of process picture-based textbooks in this high school are students of class XI MIPA of SMA 2 Jember. In this case, the population of this study is the 11th grade students of SMA Negeri 2 Jember. The technique of determining the sample from this study used a limited test and purposive sampling through student analysis. Purposive sampling is a technique of determining samples with special consideration so that they are worthy to be sampled.

This type of research is development research. Research and development methods are research methods to produce certain products, and test the effectiveness of these products. The model of learning device development chosen in conducting research on process picture-based textbooks was a 4-D development model. This development model consists of 4 stages of development namely define, design, develope, and dissemination. Data acquisition techniques in this study were in the form of documentation, tests, observations, and questionnaires.

To determine the average validation value of all validators using the formula:

$$\frac{\sum_{j=1}^{n} V_{ij}}{n}$$

With V_{ij} is the value of the j-validator against the i-indicator.

To get the gain score, the product is tasted on the field trial stages. According to Hake (1998), the gain score formula as follows.

$$\langle g \rangle = \frac{\langle S_f \rangle - \langle S_i \rangle}{\langle S_m \rangle - \langle S_i \rangle}$$

Annotation :
⟨g⟩ = gain score
⟨Sm⟩ = The students highest score
⟨Sf⟩ = Post-test score
⟨Si⟩ = Pre-test score
with gain score categories:
[g] < 0.3 : Low
0.3 ≤ [g] < 0.7 : Medium
[g] ≥ 0.7 : Height

Student response questionnaire analysis techniques conducted in the study are as follows on Table-1.

Table-1: Practical questionnaire assessment of process image-based teaching materials

Category	Positive Value Criteria	Negative Value Criteria
Really dissagree	1	4
Dissagree	2	3
Agree	3	2
Really agree	4	1

The instrument that has been filled is then searched for the average score according to the equations and criteria on Table-2.

Table-2: Positive criteria score

Interval of Value	**Category**
$3{,}50 < \overline{X} \leq 4{,}00$	Very good
$2{,}50 < \overline{X} \leq 3{,}49$	Good
$1{,}50 < \overline{X} \leq 2{,}49$	Not good enough
$\overline{X} \leq 1{,}49$	Not good

3. RESULT AND DISCUSSION

Based on the results of the analysis of the logic validity of process image-based textbooks that have been validated by three jember university expert lecturers, it shows that the image-based textbook is classified as valid. Process picture-based textbooks can be said to be valid because the value of validity is in the range of 4 to 5. The results of the analysis of the validator's assessment of process-based textbooks can be seen in Table 3.

Table-3: Results of logic validation analysis

Aspect	Validator			Average Score
	1	2	3	
Content	4	3.9	4.3	4.1
Presentation	4.1	4	3.9	4.0
Language	4	4.3	4.4	4.2
Display	4.3	3	4.3	4.2
Average				4.1

The results of the data analysis of logic validation from expert lecturers resulted in an average rating of 4.1. So it can be concluded that process picture-based textbooks can be used and feasible in learning in class.

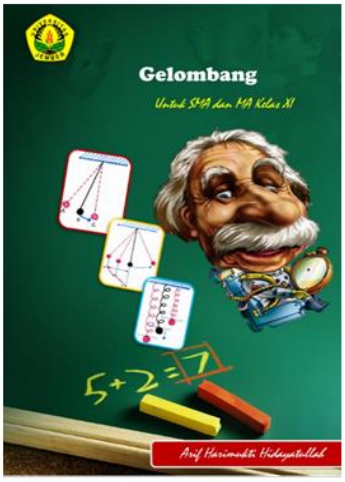

Fig-1 : Display of process pictured-based textbooks

The next development test is a field trial, namely the testing of textbooks in learning in class to measure the effectiveness and practicality of textbooks in improving students' high-level thinking skills (HOTS). To measure the effectiveness of textbooks in improving students' HOTS abilities, pre-test and post-test were conducted. From the results of the analysis using N-gain, the result is 0.83. The value of N-gain is the value of increasing the average understanding of students. Based on these values, it can be said that the effectiveness of teaching books is classified as high.

The practicality of process picture-based textbooks in this class scale trial was reviewed based on students' responses to process picture-based textbooks. Based on the response of students who took the class scale trial to process picture-based textbooks, it can be seen that the average presentation was 3.50 in the very good category. So that it can be concluded that process picture-based textbooks are practical for use in physics learning in the classroom.

4. CONCLUSION

Based on the results of the analysis of the data obtained, it can be concluded that the process picture-based textbooks has validation values from experts, namely 4.1 with a valid category. From the results of using N-gain obtained the value of 0.83, it can be concluded that the increase in the average value of students in improving high-level thinking skills (HOTS) is in the high category. Based on the response of students who took the class skla trial to process picture based textbooks, it can be seen that the average presentation was 3.50 in the very good category. So that it can be concluded that picture-based textbooks are practical processes for use in physics learning in the classroom.

The advisor given to the next researcher is that more process image-based textbooks should be developed for various other physical materials in order to improve high-level thinking skills (HOTS).

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