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Development of Junior High School Physics Science Teaching Materials Based on Critical Thinking Skills

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Development of Junior High School Physics Science Teaching Materials Based on Critical Thinking Skills

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Abstract. This research is development research with Rowntree product development model which produced Physics teaching the material in junior high school. The purpose of this study was to produce learning media in the form of valid and practical teaching materials on pressure material and its application in daily life. The subject of the research was the teaching materials for Junior High School physics subject based on critical thinking skills. Indicators of critical thinking skills used in this study are providing basic explanations, building basic skills, concluding, making further explanations, and strategies and tactics. The results of the one-to-one-evaluation through a questionnaire given to teachers obtained an average score of 4.33 and the average score of participants divide 4.72. Both the teacher and the students stated that Physics teaching materials on pressure and its application in daily life based on the critical thinking skills category are very practical. Based on the results of this study, it can be concluded that the learning media in the form of teaching materials that are developed based on critical thinking skills on the pressure material and its application in daily life is suitable for use in learning physics in junior high school.
Keywords: Teaching materials, Physics Science, critical thinking skills

1. Introduction

Science is defined as knowledge that is systematic and organized regularly, generally accepted, and in the form of data collection from observations and experiments [1, 2]. Based on this understanding, it can be concluded that the nature of science includes four main elements [3, 4], namely: (1) attitude: curiosity about an object, natural phenomena, living things, and cause-effect relationships that can be solved through correct procedures; science is open-ended [5]; (2) process: problem-solving procedures through scientific methods; scientific methods include developing hypotheses, designing experiments or experiments, evaluating, measuring, and drawing conclusions; (3) products: in the form of facts, principles, theories, and laws; (4) application: application of scientific methods and scientific concepts in daily life. The four elements are the characteristics of a complete science that actually can not be separated from each other.

Learning science requires innovations that can improve the quality of graduates. Teachers are required to carry out contextual learning which involves students in important activities that can help them relate the knowledge gained to the context of daily life they will face [6]. Besides that, the science learning that is carried out must be designed to be systematic learning using appropriate

teaching materials. Teaching materials are all forms of materials used that can help teachers in carrying out learning activities in schools [7].

To obtain learning, one of the learning resources used is teaching materials [8, 9]. Teaching material is systematic meaning it is arranged in order so that the learning of students is easier [10]. Teaching material is all materials (both information, media, and texts) that are arranged systematically or in a sequence that displays a complete figure of the competencies that students will understand. Teaching materials are used in the learning process to implement learning planning and study. Teaching material is a set of materials arranged systematically to create an atmosphere that allows students to learn [11]–[13]. Teaching materials help students to be able to study wherever and whenever independently. Therefore, one alternative learning resource that presents material to be easily understood by students is teaching the material. So that students easily master a subject matter.

Thinking is a process of cognition, mental activity to gain knowledge. Based on the process of thinking are grouped into basic thinking (rational thinking) and complex thinking (higher-order thinking). Basic thinking includes memorizing, imagining, grouping, generalizing, comparing, evaluating, analyzing, synthesizing, deducing, and inferring. While the complex thinking process consists of four types [14], [15], namely problem solving [6], [16], [17], decision making, critical thinking [18] and creative thinking [19], [20]. Critical thinking is the process and ability involved in making decisions rationally [12]. The essence of critical thinking skills is the skills in an attitude that is used by someone to assess something. Critical thinking is the realm of high-level thinking whose thoughts can and should be taught continuously and continuously [21].

Research Methods

This research is development research, using the Rowntree product development model. The product being developed is the Junior High School Physics teaching material on the subject of liquid pressure and its application in daily life. The subject of the research was the teaching materials for Junior High School Physics Science based on critical thinking skills. Data collection techniques are through a One-to-One Evaluation assessment questionnaire to teachers and students to find out the practicality of teaching materials that have been made. The study was conducted on junior high school science teachers and students in Palembang conducted by purposive sampling in the 2019/2020 school year.

3. Result and Diccussion

3.1 One-to-One Evaluation Trial Analysis

This stage is carried out to see the practicality of the learning media in the form of physics teaching materials in junior high school class VIII based on critical thinking skills that have been developed in terms of users, identify and reduce errors overall. But not only see the level of practicality of the learning media but can be known shortcomings in terms of teachers and students as users. At this stage, prototype 1 learning media in the form of teaching materials were tested on three junior high school science teachers and three junior high school class IX students who had studied the subject of pressure and its application in daily life. This is because so that they can provide suggestions and comments that are appropriate and useful to improve prototype 1 learning media in the form of teaching materials.

The One-to-One Evaluation is carried out by giving teachers and students time to use the prototype of the physics teaching instrument for class VIII based on critical thinking skills in the form of teaching materials. Furthermore, the questionnaire sheet was given to find out the responses of teachers and students to the learning media in the form of teaching materials that have been used.

The results of the One-to-One Evaluation from the teacher's questionnaire responses are presented in Table 1.

Table 1. Recapitulation results of the One-to-One Evaluation of teachers responses to teaching materials on the Substance Pressure and Its Applications in Daily Life

Indicators	Score	Category
Indicators and learning objectives in teaching materials are clearly stated	4,33	Very practical
The information presented in teaching materials is easy to understand	4,33	
The material presented in teaching materials helps students understand concepts	4,33	
The material presented in teaching materials is in accordance with the learning objectives	4,33	
Teaching materials help foster students' critical thinking skills	4,67	
Teaching materials make students more motivated to participate in learning	4,33	
The information presented in teaching materials can broaden students' insights	4,33	
The font type used in teaching materials is easy to read	4,33	
The font size used in teaching materials is easy to read	4,33	
The language used in this teaching material is simple and easy to understand	4,33	
The combination of images, colors, and backgrounds in attractive teaching materials	4	
The paper size and margins on this teaching material are right so it's easy to carry	4,33	
The display design of this teaching material is consistent and attracts attention so that it encourages students to learn it	4,33	
Average scores	4,33	

Table 1, shows the questionnaire assessment of teacher responses to teaching materials developed by the author gets the highest score of 4.67 on the indicator of teaching materials helps foster students' critical thinking skills. While the lowest score is 4.0 on the indicator combination of images, colors, and backgrounds on teaching materials not yet attractive. But in general, the average questionnaire assessment of teacher responses to teaching material pressure and its application in daily life based on critical thinking skills is 4.33 and includes a very practical category [22]. Evaluation Results One-to-One Evaluation of the questionnaire responses of students as presented in Table 2.

Table 2. Recapitulation Results of One-to-One Evaluation of Students to teaching materials on the Substance Pressure and Its Applications in Daily Life

Indicators	Score	Category
Indicators and learning objectives in teaching materials are clearly stated	5	Very practical
The information presented in teaching materials is easy to understand	4,67	
The material presented in teaching materials helps students understand concepts	4,67	
The material presented in teaching materials is in accordance with the learning objectives	4, 67	

Teaching materials help foster students' critical thinking skills	4,33
Teaching materials make students more motivated to participate in learning	4
The information presented in teaching materials can broaden students' insights	4,67
The font type used in teaching materials is easy to read	5
The font size used in teaching materials is easy to read	5
The language used in this teaching material is simple and easy to understand	5
The combination of images, colors, and backgrounds in attractive teaching materials	5
The paper size and margins on this teaching material are right so it's easy to carry	4,67
The display design of this teaching material is consistent and attracts attention so that it encourages students to learn it	4,67
Average scores	4,72

Table 2 shows the assessment of students' questionnaire responses to teaching materials developed by the author gets the highest score of 5.0 in the indicator: indicators and learning objectives in teaching materials clearly stated, the font type used in teaching materials are easy to read, the size of the font used in teaching materials are easy to read, the language used in teaching materials is simple and easy to understand, as well as the combination of images, colors, and backgrounds in attractive teaching materials. While the lowest score of 4.0 according to the teacher's response is an indicator: teaching materials make students more motivated to participate in learning, this is due to the teaching material there is still a breakdown of material that has not made students motivated to learn it. But in general, the average questionnaire assessment of students' responses to material pressure material teaching materials and their application in daily life based on critical thinking skills was 4.72 and included in the category of very practical [22].

In the One-to-One Evaluation phase above, both experts (teachers) and students are asked to study the revised prototype 1 material, then fill in the questionnaire provided so that they can find out their responses to prototype 1 used. It aims to see the practicality of the learning media that have been developed. The responses of the experts (teachers) and students will be used as a reference to revise the module (prototype 1) so that it produces prototype 2.

4. Conclussion

The results of the One-to-One-Evaluation assessment by the Palembang Natural Sciences teacher in the Palembang City obtained an average score of 4.33 (very practical category), where the teacher stated that it could be applied in learning. Similarly, the results of assessments by students obtained an average score of 4.72 (very practical category) which means it is easier to understand. Based on the results of this study it can be concluded that the learning media in the form of teaching materials that are developed based on critical thinking skills on the preassure material of substances and their applications in daily life are suitable for use in learning physics in junior high school.

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