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Development of Junior High School Science Teaching Materials Based on a Scientific Approach Assisted by Canva for Earth Structure Material for Class VIII

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Abstract* — *Natural Sciences (IPA) is one of the subjects taught in Junior High School (SMP). In learning science, educators cannot escape the challenge of creating learning that attracts students' interest in science material. So educators need to create innovation by applying an appropriate approach in delivering teaching materials by preparing relevant teaching materials in developing teaching materials to support a more interesting teaching and learning process and improve the quality of learning, namely in the form of developing teaching materials. This study aims to describe the validity and practicality of junior high school science teaching materials based on a scientific approach assisted by Canva for class VIII earth structure material that was developed. One approach that is in accordance with science subjects is the scientific approach. The scientific approach is designed to develop students' critical and analytical thinking skills in developing teaching materials. In addition to using a scientific approach, innovation is needed to be more effective and attract students' interest in learning, one of which is by developing teaching materials using interactive application media such as the Canva application. The research was conducted at SMP Negeri 1 Gondang . Based on these problems, researchers developed teaching materials based on a scientific approach assisted by Canva on the material of the structure of the earth for class VIII. This development research uses the ADDIE (Analyze, Design, Development, Implementation and Evaluation) development model in developing teaching materials. Based on the results of the research, the development of this teaching material product obtained high validity and practicality values, the teaching material product obtained an average validity value from material experts of 79.16 percent with the criteria Valid and obtained an average value of 84.16 percent with the criteria Very Valid for the validation value of media experts. While in the assessment of practicality, teachers and students obtained an average value of 79.6 percent with the category Practical. Thus, the science teaching material based on a scientific approach assisted by Canva on the structure of the earth for class VIII is suitable for use as a teaching material in science learning in the classroom.

Keyword* — *Teaching Materials, Canva , Natural Sciences, Development, Scientific Approach

I. INTRODUCTION

Natural Sciences (IPA) is one of the subjects taught in Junior High School (SMP). IPA, or what is often called natural science, is the study of a body of knowledge about natural phenomena, including the origin of the universe and its contents, including processes, mechanisms, properties of objects and events that occur. IPA is a subject that is directly related to the natural environment and human life processes, so that science subjects need to be provided at all levels of education, from elementary school to higher education, even to college [1]. Science in the context of education, especially in science learning at the junior high school level, is not free from challenges, especially for educators in creating learning that is not only informative but also can stimulate students' critical and creative thinking [1]. In Indonesia, the government also recognizes the importance of improving the quality of education to produce a young generation that is competitive at the global level. Curriculum reform efforts, such as the implementation of the Independent Curriculum, are strategic steps to improve the quality of education, by providing more freedom to students and teachers in the teaching and learning process. However, the challenges faced remain quite complex, such as the disparity in education quality between urban and rural areas, limited access to technology in various regions, and differences in understanding and implementation of the curriculum across regions. Limited resources are also a major obstacle to optimizing education quality, particularly in areas with minimal facilities and qualified teaching staff [2].

Science is also said to be systematic and interrelated knowledge about nature. Science is obtained through a series of active processes that use the mind to express something related to the universe. Among the important components in this universe is planet Earth, which has a unique and dynamic structure. The structure of the earth's layers consists of several layers: the crust, mantle, and core[3]. Each layer has characteristics that can influence natural phenomena such as earthquakes or volcanic activity. In science learning, educators are not free from the challenge of creating learning that attracts students' interest in science material. Therefore, educators need to create innovations in delivering teaching materials by preparing relevant teaching materials by developing teaching materials to support a more interesting teaching and learning process and improve the quality of learning, namely in the form of developing teaching materials.

In science learning, educators face the challenge of creating engaging learning experiences that engage students. Therefore, educators need to innovate in delivering learning

materials by preparing relevant materials and developing them to support a more engaging learning process and improve the quality of learning, specifically through the development of teaching materials. Teaching materials play a crucial role in the learning process, necessitating innovation in their development. Teaching materials are materials used by educators to facilitate the learning process. They can take the form of reading books, student companion books, or presentations[4]. The teaching materials used in Indonesia align with the independent curriculum, which emphasizes the development of science learning in junior high schools with an approach that is not limited to a single discipline [5]. The habit of using a variety of teaching materials will facilitate the development of the desired quality [6]. In developing teaching materials in the 21st century, it is hoped that every educator will develop skills not only focused on using, reading, and studying them, but can also create a product, namely developing teaching materials using an approach that is appropriate to the characteristics of students so that it can support student learning and can influence the quality of improving learning outcomes.

Approaches are essential to support the development of teaching materials. One approach that is appropriate for science subjects is the scientific approach, which can enhance intellectual abilities, particularly students' thinking skills [7]. The scientific approach is designed to develop students' critical and analytical thinking skills in developing teaching materials. To train scientific abilities, students must go through scientific activities such as observing, asking questions, reasoning, experimenting, and forming networks that link theories and concepts in science subjects with other subjects[8]. In addition to using the scientific approach, innovation is needed to make it more effective and attract students' interest in learning. One way to do this is by developing teaching materials using interactive application tools. There are many types of tools available, one of which is the Canva application, an internet program for creating graphics with various attractive templates. Canva offers designs not only for presentations but also for posters, banners, and more. Creating and explaining learning materials can be simplified when using Canva learning media, saving time for both teachers and students. Canva-based learning media has been developed to introduce more varied science learning media in schools[9].

Based on the results of interviews with science teachers of class VIII SMPN 1 Gondang, it is known that in the application of teaching materials in science subjects in particular, teachers and students still use teaching materials in the form of textbooks in the learning process. The textbooks used only contain material explanations and image displays and are not accompanied by LKPD (Student Worksheets) or evaluation questions, so that in class activities, teachers in addition to using textbooks also still look for their own sources of material along with LKPD (Student Worksheets) and evaluation questions. Science learning in the school concerned does not all students have the textbook. Based on these problems, researchers developed a teaching material based on a scientific approach with the help of Canva on the material of the structure of the earth for class VIII.

II. Ease of Use

A. *Selecting a Template*

The teaching materials developed are in the form of printed media using A4 paper measuring 29 x 21 cm, developed with the help of the Canva Pro application. The teaching materials were developed in accordance with the learning achievements of the latest curriculum and compiled by adapting to scientific steps .

B. *Maintaining the Integrity of the Specifications*

The teaching material consists of one topic, namely the structure of the earth, by adapting the steps of the scientific approach that can make it easier for users to learn it and using Times New Roman font with an easy-to-read size. The display design of the developed teaching materials is presented in various forms of elements so that it does not seem monotonous and is designed using bright colors with a dominance of light blue, dark blue and black, making the teaching materials more attractive.

III. Prepare Your Paper Before Styling

This type of research is Research and Development (R&D). This research aims to develop teaching material products that will be tested for validity and practicality. This research uses the ADDIE development model (Analysis, Design, Development, Implementation and Evaluation). The research was conducted at SMPN 1 Gondang with the test subjects in the research being 40 class VIII A students. Based on the development model used, the procedure in this research consists of 5 stages, namely: 1) *Analysis* , 2) *Design* , 3) *Development* , 4) *Implementation and* 5) *Evaluation* . The research was conducted at SMPN 1 Gondang with the test subjects in the research being 40 class VIII A students.

Based on the development model used, this study uses the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) development model. The research process has at least limitations in its development steps. Based on this, this study has a research limitation only up to the implementation stage to test the practicality of the media, supported by research conducted[10]. Based on this, media development is limited to the practicality assessment, namely developing learning media, testing its feasibility by validators and from student and teacher response questionnaires to the publication of scientific papers

A. *Analysis*

At this stage, the activities carried out by researchers include analyzing curriculum problems by paying attention to the characteristics of the curriculum being implemented . The analysis stage begins with an analysis of the available teaching materials to support the learning process. Then, researchers review learning outcomes to formulate indicators for teaching materials that will be developed in accordance with the learning outcomes outlined in the curriculum.

B. *Design*

- At this stage, the researcher's activities include identifying and collecting references regarding the Earth's structure material that will be presented in the development of teaching materials. The researcher also develops a validity assessment instrument for the

developed teaching materials using validation sheets from material experts and media experts.

- The material expert validator will be the lecturer in charge of the material in question and also the science subject teacher in charge at the school in question, and the media expert validator will be the lecturer and also the science subject teacher at the school in question.

C. *Development*

At this stage, the activities that will be carried out by researchers are realization or what is known as the product development stage[11]. The developed teaching materials are then validated by lecturers who are material experts and media experts using validity instruments that have been prepared at the design stage. The research subjects were conducted at SMPN 1 Gondang with the test subjects in the study being class VIII A students. Data collection techniques regarding the quality of this teaching material product are seen from the content, presentation of material, and design through validators who are material experts and media experts. The data analysis techniques used are quantitative and qualitative techniques. Qualitative analysis techniques are used to process data based on suggestions or input from the validator in descriptive form. The instruments needed are in the form of a validity assessment questionnaire from material experts and media experts and a practicality response questionnaire from students. The process of analyzing data from the teaching material validity instrument sheet is carried out by calculating the values given by respondents [12].

$$P = \frac{\text{Total score of respondents (f)}}{\text{Minimum score (N)}} \times 100\%$$

Data collection techniques regarding the quality of this teaching material product were assessed through validators consisting of material experts and media experts. The data analysis techniques used were quantitative and qualitative. Qualitative analysis techniques were used to process the data based on suggestions or input from the validators in descriptive form. The instruments required were a validity assessment questionnaire from material experts and media experts, and a practicality response questionnaire from students.

D. *Implementation*

- At this stage, product trials are conducted to determine the practicality of the developed teaching materials. This activity involves testing the teaching materials [13]. Practicality is assessed after conducting trials in classroom learning activities using the developed teaching materials.
- Practicality assessment was conducted using a questionnaire of student responses to the developed teaching materials. Data analysis from the questionnaire was carried out by calculating the scores given by respondents[14]. Practicality assessment was carried out using a questionnaire of student responses to the developed teaching materials. Data analysis from the questionnaire was carried out by calculating the scores given by respondents[14]

$$P = \frac{\text{Total score of respondents (f)}}{\text{Minimum score (N)}} \times 100\%$$

- assessment from experts and also the student and teacher response questionnaires using a Likert scale of 1-4 until the valid and practical criteria are met. As well as the student and teacher response questionnaires until the practical category is met .

IV. Using the Template

The elements required in teaching materials are explained in the planning stage, such as creating a map of teaching material needs and a framework for teaching materials. At the product development stage, researchers carried out development using the help of the Canva application. On the initial cover of the teaching material by providing information on teaching materials for the subject of Science with a scientific approach for grade VIII which is given an illustration that shows the relationship with the material that creates a neat impression and is given several shapes and elements of junior high school students to add to the attractiveness of the cover of the teaching material. Furthermore, for the design of the initial chapter separator on the page with a consistent template with borders and corners in the form of cloud elements and given a title accompanied by learning objectives and given image elements in the form of earth and rectangular elements with hanging elements containing the text of the learning objectives of the teaching material. Based on the steps of the ADDI research model that have been carried out, the following results were obtained.

A. *Validity of Teaching Materials*

At the product development stage (Development), the developed teaching materials are tested for validity using a validity questionnaire instrument by a validator. Validation of teaching materials based on a scientific approach assisted by Canva for the Earth's structure material for grade VIII is carried out through the validation stage by material experts and media experts. In this case, media validation and material validation are carried out by 4 different validators , including media validation carried out by 2 lecturers and material validation carried out by 1 lecturer and 1 teacher. The following is a presentation of the data from the validation assessment results by material experts and media experts in Fig. 1.

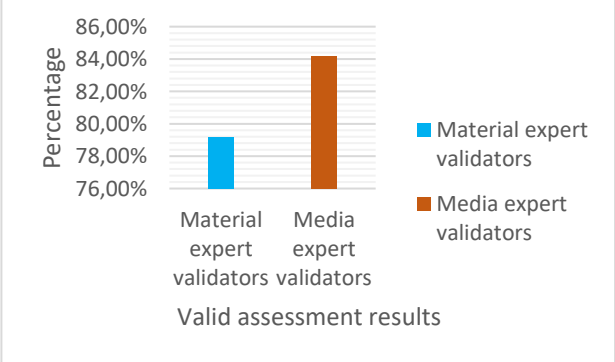

Fig. 1 Expert validator assessment diagram

Identify applicable funding agencies here. If none, delete this text box.

Based on Fig. 1, In the first validation by material experts, the average score was 79.16%, and in the second validation by media experts, the average score was 84.16%. Overall, the validation results showed a validation percentage of 82% from both material and media aspects, which means that the scientific approach-based teaching materials assisted by Canva for the eighth grade earth structure material are very valid and can be used as teaching materials for teaching and learning activities in the classroom. This was adapted from the assessment criteria by (Sugiyono 2014, quoted by Rismayanti, 2022)[14] which states that assessment criteria that are in the average value range of 82%-100% are categorized as very valid.

B. Practicality of Teaching Materials

Teaching materials that have been declared valid by the validator will be used in the next stage, namely the implementation stage. At this stage, a product trial is carried out to measure the level of practicality of the teaching materials that have been developed. The level of practicality is assessed after the completion of the product trial in teacher and student learning activities using teaching materials on the earth's structure. The practicality assessment is carried out by completing a practicality response questionnaire of the teaching materials during the learning process. The following is a presentation of the results of the practicality assessment data from the teacher and student response questionnaires in Table I.

TABLE I. RESULTS OF THE TEACHER AND STUDENT PRACTICALITY RESPONSE QUESTIONNAIRE

No	Respondents	Presentation Score Obtained
1	Teacher	78.4%
2	Participant educate	80.8%
	Total	**159.2%**
	Presentation Score	**79.6% (Practical)**

Based on table I, the results of the product trial show that the practicality value of teachers and students during the trial of using teaching materials obtained an average value of 79.6% of the total presentation with assessment criteria [15] which states that the assessment standard is in the range of an average value of 61% -80% categorized in the practical category. With details of 78.4% with the practical category for the practicality value of teachers, in the assessment of teacher practicality includes several aspects, namely the suitability of learning objectives, feedback and motivation in increasing knowledge and insight. Meanwhile, for the assessment of student practicality, the results were 80.8% of 40 students. In this assessment of student practicality, it includes the attractiveness of teaching materials, ease of use, ease of understanding content and context as well as student enthusiasm for learning using teaching materials.

The teaching materials developed through the ADDIE model stages as proposed by [16]. The educational philosophy for the implementation of ADDIE is deliberate learning and must be student-centered, innovative, authentic, and inspiring. ADDIE is a validation process because it is used to verify a product and is adjusted to procedures related to the development of guided learning. The analysis was carried out by analyzing the state of the teaching materials available to support the implementation of the learning process. Researchers interviewed 8th grade science teachers regarding learning outcomes to formulate indicators for teaching materials to be developed in accordance with learning outcomes based on the curriculum. Strengthened by research [17], development by adapting the latest curriculum was carried out according to what was needed by teachers and students.

The curriculum implemented at SMPN 1 Gondang uses the independent curriculum. In addition to adapting to the latest curriculum, an approach was also selected in accordance with the opinion [7], one approach that is appropriate for science subjects is the scientific approach, which can improve intellectual abilities, especially students' thinking skills. This is supported by research by [8], which states that to train students' scientific abilities, scientific activities such as observing, asking questions, reasoning, experimenting, and forming networks that link theories and concepts in science subjects with other subjects are essential. It is important to develop teaching materials.

The preparation of the validity assessment instrument of the teaching material development product through validation by material experts and media experts which was then assessed by 3 lecturers and 1 science teacher of grade 8. Validity assessment is important to do because the product is not suitable for use or testing until the experts determine that the product is valid. This statement is based on[18] which states that if the expert assessment shows that it is valid then the product is suitable for use as a teaching material and if the assessment results show that the teaching material is not valid then the teaching material is not suitable for use in learning. Printed handout teaching materials contain several components: descriptive material, charts, assignments, and reference materials [19]. According to [18], the principles of compiling handouts are the same as the principles of compiling teaching materials, namely relevance, consistency, and coverage. The principle of relevance is a principle that requires the content of the material to be in accordance with the learning objectives of learning outcomes. The principle of consistency means that all written material must be consistent [20]. The teaching materials created are then validated by lecturers who are subject matter experts and media experts using validity instruments developed during the design stage. Product development is also carried out using printed media.

The level of practicality is assessed after the validation stage and then tested in classroom learning using the developed teaching materials. The practicality assessment is carried out using a questionnaire response from students to the developed teaching materials. The developed teaching materials are applied in actual conditions, namely in the classroom. This research is in accordance with the opinion of [21] , where teaching materials are all forms of information and learning materials that have been systematically arranged which are used to assist teachers/instructors in carrying out learning activities, where the results of this study are also supported by research conducted by [22] that in improving

student academics, appropriate teaching materials are needed and the interaction between providing textbooks through learning innovations can improve students' understanding abilities and teaching materials that have been tested for their feasibility can improve students' conceptual understanding and are suitable for use in science learning.

C. Conclusion

Based on the research results, it shows that the scientific approach teaching material for the earth's structure developed with the ADDI model is very suitable for use in classroom learning activities. Overall, the validation results for both aspects, which include the material and media aspects, show a percentage of 81.88%, meaning that this scientific approach teaching material is suitable for use as teaching material in classroom learning activities.

Based on the results of the product trial, the practicality value of teachers and students during the trial use of the teaching materials obtained an average value of 79.6% of the total presentation categorized as practical. From the obtained practicality value, it can be concluded that this teaching material can motivate students to learn using the teaching materials and easily understand the context of the teaching materials.

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