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Validity of Teaching Materials Based on Problem Based Learning Using Contextual Teaching and Learning Approach to Improve Critical Thinking

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Abstract— This article discusses the analysis of the results of the validation of physics teaching materials based on a problem-based learning model using the CTL approach to improve students' critical thinking skills. The validation was carried out by three experts at Padang State University. The experts are one language lecturer and two physics lecturers. The validation of teaching materials was carried out to know the validity and feasibility of teaching materials used to improve students' critical thinking skills in schools. This research is development research that aims to develop products in the form of physics teaching materials. The instrument used in this study was the validation sheet for teaching materials. The aspects assessed on the Physics teaching material validation sheet instrument are the components of teaching materials, the feasibility of the content of teaching materials, construction of teaching materials, the language of teaching materials, and the graphic of teaching materials. This research uses descriptive statistical methods. The stages in this research are prepared in the form of designing and developing validation instruments, implementing in the form of collecting validation data, and completing the form of data analysis reports. The data analysis in this study used Aiken's V. formula. This formula consists of two categories, namely valid and invalid. The results of the analysis in this study indicate that the teaching materials are in the Valid category and can be used in the field.

Keywords — Contextual teaching and learning, Validation, Critical Thinking, Problem Based learning, Teaching Material.

I. INTRODUCTION

Education is a long-term investment in human resources in the continuity of human life. Education itself is a conscious and planned effort by humans through learning to be able to help develop human potential as expected. Therefore, education and learning are inseparable unity and have the most important role in the development of the nation and state. Education is a plan to realize the learning process so that students become active in developing their potential to be better as needed in the environment. The existence of education in human life aims to create humans who have quality and character so that they are able to master and have extensive knowledge to be able to achieve the expected goals. Education is able to motivate humans to develop and change for the better. So, quality education will form human resources who are able to develop strategies to achieve the expected competencies.

The quality of human resources greatly determines the progress of a country. One of the efforts that have been made is to improve the quality of Indonesian education. The

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government has made efforts to innovate, namely changes to the 1984 curriculum until the 2013 curriculum. The 2013 curriculum can produce productive, critical, innovative, and active students who are applied to integrated attitudes, knowledge and skills [1]. The implementation of the 2013 Curriculum uses models and approaches in learning to match what is expected [2]. The 2013 curriculum helps education to produce student learning outcomes by monitoring and evaluating the learning process on an ongoing basis. One of the subjects that plays an important role in developing human resource potential is Physics lessons. Physics is the study of natural phenomena, this science further explains its implementation and role in human life [3]. Learning Physics is one of the lessons that is often considered difficult by some students. This is evidenced by the opinion of students that physics lessons are identical with many formulas and problems that are difficult to master, and the ignorance of students about the implementation of these materials in everyday life so that students are not interested. Therefore, strategies and innovations are needed to help students in a learning process that is interesting and easy for students to understand.

One of the efforts that can be made to overcome the problems faced is to develop physics teaching materials that are following the demands of the 2013 Curriculum [4]. Teaching materials that are following the 2013 Curriculum demands to apply models and approaches. In the field, it was found that some of the teaching materials or learning resources used had not yet formulated models and approaches. The application of physics teaching materials is expected to be able to solve problems and improve students' understanding in the learning process. The application of physics teaching materials can achieve the expected competencies so that quality human resources are created. Teaching materials are one of the important components in helping the learning process in schools and supporting the learning success of students [5]. Teaching materials are a form of material that is used to assist the learning process of both teachers and students [6]. Teaching materials contain material and are arranged systematically as needed and can be used by students in learning activities [7]. The characteristics possessed by the teaching materials are, namely self-instructional; self-contained; adaptive; user friendly; stand alone; [8]. The teaching materials developed must be following the learning objectives so that students can easily understand the learning material. The benefits of teaching materials are to help direct learning activities, as an evaluation tool in achieving student learning outcomes. The general structure that must be owned by teaching materials is 1) learning instructions; 2) competencies to be achieved; 3) Learning material; 4) supporting information; 5) exercise; 6) worksheet; 7) evaluation [9]. Based on the structure of the teaching material, it is expected to be able to help learning activities and increase the competence of students.

The use of teaching materials must be supported by the application of models and approaches in learning. This is because models and approaches are important components in the learning process to achieve the expected learning objectives. One of the innovative learning models in the 2013 Curriculum which is applied in teaching materials is the Problem based learning (PBL) model. This model is a model that trains students to solve real-world problems related to learning materials so that they can improve students' competence and critical thinking. The application of this PBL model can be supported by using a contextual teaching and learning (CTL) approach. This approach is very suitable to be applied in learning [10]. The CTL approach is an approach with a learning concept that can help teachers and students relate learning materials to real-world situations [11]. This learning concept is expected to provide meaning in learning for students. The characteristics of the CTL approach are 1) learning is carried out in a real world context; 2) learning to train students to do meaningful tasks; 3) learning is carried out by providing different experiences for students; 4) learning is carried out through group work that trains students to solve problems; 5) this concept can create a sense of togetherness and to understand each other deeply from one individual to another; 6) this learning concept trains students to be active, creative, critical, productive; 7) this concept can generate enthusiasm and interest of students in learning [12]. The combination of PBL and CTL models can improve students' critical thinking skills.

Critical thinking is the ability to manage and analyze ideas or ideas which are expected to be able to guide and train students to be active, innovative, critical, and contextual so that students can understand and develop their knowledge and skills. This ability encourages students to think and bring up new thoughts about real-world problems at hand. Therefore, the application of the PBL model and the CTL approach to this teaching material is expected to be able to improve students' critical thinking in overcoming the problems faced. One of the goals is also to help in making it easier for students to understand learning material, so that the expected competencies are achieved.

Before it can be implemented in the field, teaching materials must follow the validity test. In this study, there were three experts, namely one language lecturer and two

physics lecturers. Validation aims to show an instrument or product is accurate and valid. This validation is needed in determining the quality of the development of physics teaching materials. Validity is needed to determine the validity and validity of the product being developed. The purpose of this validity is to assess and the basis for improving the developed product to get a valid product.

II. METHODS

This research is a development research. This research was conducted to produce products that have conducted validation tests and produce valid products so that these products can be used in the learning process. The product developed is Physics teaching materials based on the Problem Based Learning model using the CTL approach to improve students' critical thinking. The steps taken by the researcher to determine the validity of the product are the first, the researcher designs and validates the instrument made. This instrument is useful for measuring the validity of the product to be used. Second, the instrument or validation sheet was given to three validators, namely a physics education lecturer, a physics lecturer, and a language lecturer. Third, the results of the validation sheet analysis.

The research method used is a questionnaire method (questionnaire). The questionnaire (questionnaire) is a technique by providing a statement to the validator to provide an assessment of the product being developed [13]. The data collection technique in this study uses a Likert scale. Likert scale is a scale to measure a person's opinion or judgment about a phenomenon [14]. The scoring for each statement item on the Validation sheet is:

Table 1. Category and Likert Score on the Validation Sheet

Score	Category
4	Strongly Agree
3	Agree
2	Disagree
1	Strongly Disagree

The data analysis technique used in this research is descriptive statistical analysis techniques. The results of the questionnaire analysis were obtained by adding up the total score of each validator for all indicators. The calculation for obtaining the validation value uses the Aiken's V formula as follows:

$$V = \frac{\sum s}{[n(c-1)]} \quad (1)$$

Information:

s = r - lo

lo = the lowest number of validity assessments (in this case = 1)

c = the highest number of validity assessments (in this case = 4)

r = number given by the validator

Based on the final score obtained through these calculations, the criteria for the Validation Assessment for Physics teaching materials based on the Problem Based Learning model using the CTL approach are determined by the provisions in Table 2.

Table 2. Product Validation Categories [15]

Value	Criteria
≥ 0,6	Valid
< 0,6	Invalid

III. RESULT AND DISCUSSION

The data obtained in this study is the result of data in the form of an assessment from the validator. The assessment is given to measure or find out the validity of a product. Valid is accuracy or validity and can be used to measure what should be measured [16]. This research data is an assessment of three validators or people who are experts in their fields, namely physics education lecturers, physics lecturers, and language lecturers. This study is an analysis of the validator's suggestions and assessment of the Validation sheet. Expert validation sheets are used as a basis for improvement to obtain valid products. This data consists of five aspects of validation, namely the components of teaching materials, the feasibility of the contents of the teaching materials, the construction of teaching materials, the language of the teaching materials, and the graphic of the teaching materials [17]. This data is one of the studies from development, but in this study, it is only limited to the validity of the product.

The first validity aspect is the teaching material component. the teaching material component is the most important thing that must be done at the time of validity. The teaching material components include learning instructions, competencies to be achieved, learning materials, exercises, evaluation, and assessment [17]. Teaching materials are developed to be used in assisting in learning activities. The teaching material is said to be valid if it has been assessed by experts and achieves results according to the specified criteria. The following table of validity aspects of the teaching material components can be seen in Table 1.

Table 1. Component Aspects of Teaching Materials

No	Aspects assessed	Validator			Average V
		1	2	3	
1	The title / identity of the teaching material refers to KD.	4	3	4	0,833
2	Learning instructions in teaching materials are addressed to teachers and students	4	3	3	
3	Learning objectives in accordance with KD.	4	3	4	
4	The learning material refers to the basic competencies to be achieved.	4	3	4	
5	Teaching materials contain a problem based learning model.	4	3	4	
6	Teaching materials use a contextual teaching and learning approach.	3	3	4	
7	Exercise and evaluation are in accordance with the learning material	3	3	4	
8	Assessment in Teaching Materials is carried out on the process and work results of students.	3	3	4	

Table 1 presents the validation results on the teaching material components. The validator considers the components of teaching materials as valid with a V value of 0.833. This can be seen from the table that the component aspects of the teaching material are in the Valid category.

The second validity aspect is the feasibility of the content of the teaching materials. This aspect assesses the content of the teaching material. The aspect of the feasibility of the contents of this teaching material includes the content and format of the teaching materials developed. The indicators assessed include the material presented according to KI and KD, facts on the presentation of the material, the concept of the material presented, writing formulas, phenomena that exist in teaching materials, and the benefits of the teaching materials [17]. The appropriateness of the content of this teaching material needs to be considered because if the content of the teaching material is feasible it will greatly help teachers and students in understanding the material in learning activities. The following table of validity aspects of the feasibility of the content of teaching materials can be seen in Table 2.

Table 2. Feasibility Aspects of the Content of Teaching Materials

No	Aspects assessed	Validator			Average V
		1	2	3	
1	The material presented in the Teaching Materials is in accordance with the demands of the formulated KI and KD.	4	3	4	0,827
2	Facts in the presentation of the problem given are in accordance with the topic in the material.	4	3	4	
3	The facts presented can improve students' understanding.	3	3	4	
4	The concept of teaching materials is in accordance with physics.	4	3	4	
5	The concept presented does not lead to many interpretations.	4	3	4	
6	Equations / formulas in teaching materials are in accordance with the writing of physics formulas.	3	3	4	
7	The case phenomena presented in the Teaching Materials are in accordance with everyday life.	4	3	3	
8	The case phenomena presented in the Teaching Materials can improve students' understanding.	3	3	4	
9	Activities in Teaching Materials encourage the curiosity of students.	3	3	4	

Table 2 presents the validation results on the feasibility of the content of teaching materials. The validator considers the appropriateness of the content of teaching materials as valid with a V value of 0.827. This can be seen from the table that the component aspects of the teaching material are in the Valid category.

The third validity aspect is the construction of teaching materials. This aspect assesses the structure and characteristics of the teaching material. The indicators that are assessed include the presentation of teaching materials that are following the structure, the characteristics of the teaching materials in the form of models, approaches, and objectives for making the teaching materials [17]. The purpose of this teaching material is to improve the critical thinking skills of students. Construction needs to be assessed because the presentation must be following the structure and have characteristics or characteristics, so that it is following the provisions and objectives to be achieved in learning. The following table of validity aspects of the construction of teaching materials can be seen in Table 3.

Table 3. Construction Aspects of Teaching Materials

No	Aspects assessed	Validator			Average V
		1	2	3	
1.	The presentation is in accordance with the order of the standard teaching materials.	4	3	4	0,847
2.	Phase 1. Student Orientation to Problems The process of explaining learning objectives, motivating students to engage in problem-solving activities, so as to provoke curiosity of students to build knowledge (observe).	4	3	4	
3.	Phase 2. Organizing Students To Learn This stage helps students to define and facilitate students to formulate problems based on the phenomena presented (Asking)	3	3	4	
4.	Phase 3. Guiding Individual and Group Investigations. Facilitating students to conduct investigations (Trying).	4	3	4	
5.	Phase 3. Guiding Individual and Group Investigations. Facilitating students to process data (Associate).	4	3	4	
6.	Phase 4. Developing and Presenting the Work (Communication). Facilitating students to conclude the results of the investigation (interpreting and applying concepts).	3	3	4	
7.	Phase 4. Developing and Presenting the Work (Communication). facilitate students to communicate the results of their investigations (communicating).	3	3	4	
8.	Phase 4. Developing and Presenting the Work (Communication). Facilitating students to discuss understanding the concept with their friends (communicating and asking questions).	3	3	4	
9.	Phase 4. Developing and Presenting the Work (Communication). facilitate students to confirm understanding of the concept to the teacher (communicate and ask questions).	3	3	4	
10.	Phase 5. Analyzing and Evaluating the Learning Process (Reflection). Facilitating teachers and students in carrying out learning reflection activities.	4	3	4	
11.	Approach 1. Constructivism Facilitating students to build knowledge through the environment or experience.	3	3	4	
12.	Approach 2. Asking Facilitating students to ask questions.	4	3	4	

13.	Approach 3. Learning Community. Facilitating students to carry out learning in groups.	4	3	4	
14.	Approach 4. Modeling Facilitating students to do real model examples on material / experiments.	3	3	4	
15.	Approach 5. Inquiry Facilitating students to find their own knowledge.	3	3	4	
16.	Approach 6. Reflection Facilitating students to analyze, re-evaluate (conclude).	3	3	4	
17.	Approach 7. Authentic Assessment Facilitating teachers to be able to carry out authentic assessments of students	3	3	4	
18.	Interpretation Aspects Facilitating students to be able to provide ideas, explain, and group the issues being asked.	3	3	4	
19.	Aspect Analysis Facilitating to be able to express opinions, and test ideas (linking knowledge and experience).	3	3	4	
20.	Interference Aspect Facilitating students to provide conclusions with clear reasons.	3	3	4	
21	Aspect Evaluation Facilitating students to connect the material with the problems at hand.	3	3	4	

Table 3 presents the validation results on the construction of teaching materials. The validator considers the construction of teaching materials as valid with a V value of 0.815. This can be seen from the table that the construction aspects of teaching materials are included in the Valid category.

The fourth aspect of validity is the language of the teaching materials. This aspect assesses the language used in the teaching material. The language aspects developed in this teaching material include readability of teaching materials, clarity of information on teaching materials, conformity with good and correct Indonesian language rules. The indicators assessed include the language used by the cognitive and emotional development of students, the information conveyed, language that motivates students, use of good and correct words. Language in teaching materials plays an important role because language helps students to understand learning material. If a teaching material uses complex language and does not follow General Guidelines for Indonesian Spelling (PUEBI), students will be more complicated to understand the learning material. Therefore, the use of language plays an important role in the development of teaching materials. The following table of validity aspects of the language of teaching materials can be seen in Table 4.

Table 4. Language Aspects of Teaching Materials

No	Aspects assessed	Validator			Average V
		1	2	3	
1	The language used is in accordance with the level of cognitive development of students.	4	4	4	0,847
2	The language used is in accordance with the emotional maturity level of students.	3	4	4	
3	Messages or information are conveyed in communicative language.	4	4	4	
4	Language in Teaching materials encourages students to be actively involved in learning activities.	3	3	4	
5	The conjunctions used in teaching materials are in accordance with the writing rules.	3	3	3	
6	The sentences presented in the teaching materials are effective.	3	3	4	
7	The terms used in teaching materials are consistent.	4	3	4	
8	The spelling used refers to PUEBI.	4	3	3	

Table 4 presents the validation results on the language of teaching materials. The validator considers the language used in teaching materials as valid with a V value of 0.847. This can be seen from the table that the language aspects of teaching materials are included in the Valid category.

The fifth validity aspect is the graphic of the teaching material. This aspect assesses the graphics used in the teaching material. The graphic aspects developed in this teaching material include the use of type of writing, size, layout, illustration of images, photos, and display of teaching materials [17]. The indicators assessed include teaching materials using clear and legible fonts, teaching materials that have an orderly layout, the placement of image captions in teaching materials is correct, and the illustrations presented in the teaching materials can be understood. Graphic in teaching materials is very important because the appearance of attractive teaching materials will help students to be motivated in their learning. If a teaching material is used unattractive, it is inconsistent in size and layout. So anyone who reads will feel bored and not eager to continue reading the teaching material. Therefore, appearance is also very important in the development of teaching materials. The following table of validity aspects of the graphic of teaching materials can be seen in Table 5.

Table 5. Graphic Aspects of Teaching Materials

No	Aspects assessed	Validator			Average V
		1	2	3	
1	Teaching materials use clear and legible fonts.	4	4	3	0,889
2	Teaching materials have an orderly layout.	4	4	4	
3	The placement of image captions in teaching materials is correct.	3	4	3	
4	The illustrations presented in Teaching materials can build students' understanding.	3	4	4	

Table 5 presents the validation results on the graphic of teaching materials. The validator considers the graphic of the teaching materials developed as valid with a V value of 0.889. This can be seen from the table that the graphic aspects of teaching materials are included in the Valid category.

IV. CONCLUSION

Based on the results of the analysis of the validation sheet by three validators, the teaching materials developed are categorized as valid and usable. The results of the validation sheet analysis can be used to measure the improvement of students' thinking skills. This teaching material is expected to have a positive impact on the critical thinking skills of students so that it can increase the competence of students. The average obtained from the results of the analysis of the validation sheet is the component aspect of teaching materials, the validity value obtained is 0.833, categorized as valid. In the aspect of the feasibility of the content of teaching materials, it is obtained that 0.27 is categorized as valid. In the construction aspect of teaching materials, it is obtained that 0.815 is categorized as valid. In the language aspect of the teaching material, it was obtained 0.847, and the graphic aspect of the teaching material was obtained 0.889 categorized as valid. The average result of the validation analysis is categorized as Valid. These results are obtained through the Aiken's V. formula. Based on the results of this study, it shows that the teaching materials developed have components, content, construction, language, and graphics that are appropriate and can be applied in the field.

REFERENCES

[1] Mulyasa. 2014. Pengembangan dan implementasi Kurikulum 2013. Bandung: PT. Remaja Rosdakarya.

[2] Hosnan, M. 2014. Pendekatan Saintifik dan Kontestual dalam Pembelajaran Abad 21. Jakarta: Anggota IKAPI.

[3] Trianto. 2010. Model Pembelajaran Terpadu. Jakarta : Bumi Aksara.

[4] Asrizal, Amran, A., Ananda, A., Festiyed, R. Sumarmin. 2018. The Development Of Integrated Science Instructional Materials To Improve Students' Digital Literacy In Scientific Approach. Jurnal Pendidikan IPA Indonesia, Vol. 7 (4): 442-450.

[5] Chosim, Widodo S. dan Jasmadi. 2008. Panduan menyusun bahan ajar berbasis kompetensi. Jakarta: PT. Elex Media Komputindo.

[6] Asrizal, Amran, A., Ananda, A., Festiyed, dan Khairan, Suci. 2018. Effectiveness of integrated science instructional material on pressure in daily life theme to improve digital age literacy of students. Journal of Physics: Conference Series, Vol. 1006 (1): 1-7.

[7] Arlitasari, Oni., Pujayanto dan Budiharti, Rini. 2013. Pengembangan Bahan Ajar IPA Terpadu Berbasis Salingtemas dengan Tema Biomassa Sumber Energi Alternatif. Jurnal Pendidikan Fisika, 1(1): 83-84.

[8] Widodo & jasmadi. 2008. Panduan Menyusun Bahan Ajar Berbasis Kompetensi. Jakarta: PT. Elex Media Komputindo.

[9] Prastowo, Andi. 2012. Panduan Kreatif Membuat Bahan Ajar Inovatif. Jogjakarta: Diva Press.

[10] Laili, H. 2016. Keefektifan Pembelajaran dengan Pendekatan CTL dan PBL Ditinjau dari Keterampilan berpikir kritis dan Prestasi Belajar Matematika Peserta Didik. Jurnal Pythagoras,pendidikan Matematika. 11(1): 25-34.

[11] Setiawan, Ibnu. 2007. Contextual Teaching and Learning: Menjadikan Kegiatan Belajar-Mengajar Mengasyikkan dan Bermakna, diterjemahkan dari karya Elaine B. Johnson, Contextual Teaching and Learning: what it is and why it is here to stay, Bandung: MLC. Cetakan ke-3.

[12] Muclish, M. 2012. Pembelajaran Berbasis Kompetensi dan Kontekstual. Jakarta: Bumi Aksara.

[13] Sugiyono. 2017. Statistika untuk Penelitian. Alabeta: Bandung.

[14] Sugiyono. 2010. Metode Penelitian Kuantitatif, Kualitatif, dan R&D. Alfabeta: Bandung.

[15] Azwar, S. 2015. Penyusunan Skala Psikologi Edisi 2. Yogyakarta: Pustaka Belajar.

[16] Sugiyono. 2012. Metode Penelitian Kuantitatif, Kualitatif dan R&D. Bandung: Alfabeta.

[17] Depdiknas. 2008a. Panduan Pengembangan Materi Pembelajaran. Jakarta: Direktorat Pembinaan Sekolah Menengah**.**