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Development of Student Worksheets Using Problems Based on Momentum and Impulse Materials for Physics Learning in Senior High School

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ABSTRACT

The 2013 curriculum demands the studentsactiveness in learning and recommends one d, namely the problem-based model of learning. The aims of this study are 2, that is 1) To produce problem-based worksheets of student *on momentum and impulse material forphysics learning in senior high school. 2) To reveal the quality of problem-based* worksheets of student *on momentum and impulse material forphysics learning in senior high school, in terms of validity and practicality.The research was conducted using the model of ADDIE development. The object of the research is a problem-based student worksheet on momentum and impulse material. The data collection instruments used test sheets of validityandtestsheets of practicality. The data analysis technique used is product validity analysis and product practicality analysis. The first studyresults, the* worksheets of student *produced are by the design made and have a structure based on the 2008 Ministry of National Education. The* worksheets of student *have a steps PBL model. The second studyresults, the feasibility of PBL*worksheets of student *on momentum and impulse material in terms of validity tests are in the category was very valid with the value of average on student worksheet validation from experts being 84.6%. and in terms of practicality the Physics teacher, is in the category was very practical with anvaluein average of 88.17% and the practicality test by students is in the category was very practical with an valuein average of 91.47%. So it can be concluded that the problem-based* worksheets of student *on Momentum and Impulse Materials that have been developed have good validity and practicality and can be used in the Physics process of learning.*

Keywords:*student worksheets using problems based; momentum and impulse.*

I. INTRODUCTION

Physics is a vehicle for developing thinking skills that are useful for solving in everyday life problems. Physics does not only contain theory and memorization, but requires the process of forming knowledge through discovery and data presentation [1]. In the process of learning physics, the willingness of students to study learning resources is very important [2]. Therefore, the learning resources used by the teacher should be able to quality improve on physics learning. The 2013 curriculum requires students to be more engaged in their studies [3]. The process of learning cannot be separated from models, media, and outcomes of learning. The 2013 curriculum recommends several model of learning, one of which is a problem-based model of learning.

Problem-based model of learning has a main focus on problems. The problem-based model of learning often referred to as the PBL model, is a model of learning based on solving and investigating real problems. PBM learning uses authentic problems that require students to discuss with each other in investigating and collecting data to find solutions to problems[4]. The PBL model has three characteristics, namely learning focuses on problem-solving, students are responsible for solving problems and teachers guide students' efforts to solve existing problems [5]. The problem in the PBL model is an open problem. This means that the answer to the problem is not certain so each student can think and develop possible answers [5]. The steps of the PBL model are 1) orientation of students to problems, 2) organizing students to learn, 3) guiding individual and group experiences and 4) developing and presenting work. and 5) analyze and evaluate the problem-solving process [6]. The results of the study [7] show that using the PBL model can improve the physics outcomes of learning of high school students. The study results [8]show that the PBL model affects the outcomes of learning of physics because in each stage the PBL model requires students to be more active, critical, and responsible in the

process of learning so that they can train students to find new ideas. The results of the study [9] show that learning using problem-based learning models can increase student activeness and make students focus on learning which causes student learning outcomes to increase. So, PBLmodel focuses on problem-solving that can make students more active, and train students to find new knowledge so that they can optimize students thinking skills.

To further optimize the PBL model, in learning, teachers should use supportive learning resources. One of the learning resources that can be used as materials of teaching in the form of Student Worksheets [10]. The right Student Worksheets will help students understand the material [11]. According to[12] "Student Worksheet is a student guide used to conduct investigations or problem solving". Student worksheets are materials of teaching that are packaged in such a way that students are expected to be able to learn independently [13]. Student worksheets are task sheets containing material and practicum activities that must be done by students in the process of learning [14]. LKPD is a tool in teaching and learning activities so that the implementation of learning can run smoothly and effectively [15]. The tasks contained in the student worksheets must be clear and the basic competencies that will be ac even by students. The benefits of student worksheets are that they can provoke students to be actively involved in the process of learning and help students find a concept in learning [16]. Therefore, it is very important to use worksheets of student in the process of learning so that students become active and independent.

Based on the initial results observations conducted at senior high school number 4 Bukittinggi. After reviewing the daily assessment results, it turns out that the momentum and impulse materials have a low value in average of 60.36. The low results of this daily assessment are because there are still many students who are not consistent in making examples to solve problems. Students still do not understand what is known in the question and what is asked in the question. Students still do not understand how to enter known numbers into formulas. Some students are confused about applying concepts to questions. Research [17], shows that students' problem-solving skills on momentum and impulse materials tend to be weak. The physics concepts used still tend to be less appropriate. Students use wrong concepts to solve problems. Students have difficulty relating the concepts they understand to the problems they face. Students' explanations have not been in-depth regarding the relationship between impulsive style and touch time. Conceptual knowledge on the concept of the relationship between impulses and changes in momentum is still lacking.

The obtained in other fields results are the limited use of learning tools. Teachers have not developed materials of teaching in consist of worksheets of student with model of learning due to time constraints in designing and designing them. The limitations of learning tools can affect the quality of learning [18]. The physics learning process must be packaged and managed well in order to realize meaningful learning [19]. Good learning tools are indicators of maximum learning implementation [20]. Learning tools need to be considered for their quality in terms of content, design, media and development methods [21]. Therefore, the learning tools used should be able to support the process of learning.

From the conditions in the field that have been found, one solution that can be given is to develop worksheets of student that are equipped with problem-based learning syntax. The existence of PBL worksheets of student can make it easier for teachers to convey material and can also make it easier for students to understand the material. PBL worksheets of student must be developed so that learning is student-centered so that students become more active and can improve student outcomes of learning. There are several previous studies related to the development of PBL worksheets of student, including research [22] showing that the PBL worksheets of student developed have valid, practical,l and effective characteristics, so they are feasible to be developed on other materials. The study results [23] showed that PBL-based physics worksheets were feasible to increase the participation and outcomes of learning of students in class X senior high school. The results of the study [24] show that learning using problem-based LKPD can improve student learning outcomes and motivation. The results of the study [25] show that problem-based LKPD can increase student interest in learning.

Based on the background that has been disclosed, the researcher is interested in researching the development of PBL worksheets of student on momentum and impulse material for proper and practical senior high school physics learning. The designed worksheets of student will contain steps PBL model to direct students in learning physics. Therefore, the title of this research is "DevelopmentOf worksheets of student Using Problems Based On Momentum And Impulse Materials For Physics Learning In Senior Senior high school". The aims of this study are 2, that is 1) To produce PBL worksheets of student on momentum and impulse material for physics learning in senior high school. 2) To reveal the quality of PBL worksheets of student on momentum and impulse materials for physics learning in senior high school, in terms of validity and practicality.

II. METHOD

The type of research conducted is research and development (Research and Development). This study aims to produce a new product, namely PBL worksheets of student on momentum and impulse materials for physics learning in senior high school that are feasible and practical for students to use in the process of learning. In this study, researchers used the stages of ADDIE research and development. The development model has 5 stages of development, namely: (1) analysis, (2) design, (3) development, (4) implementation, and (5) evaluation [26].

The analysis stage is the identification and problem analysis stage. In the analysis phase, the researcher identified the gap between the learning conditions and the desired results. This first stage defines the problem that needs to be done by developing a student worksheet. Problem analysis was carried out at senior high school number 4 Bukittinggi such as mastery of teacher teaching models, learning media, and other problems. At the problem analysis stage, the researchers conducted observations and interviews with physics teachers.

The design phase aims to design the product to be developed and the product design to be developed. At this stage, the selection of formats is adjusted to the format of the worksheets of student which are equipped with problem-based learning syntax with interesting criteria, helping and facilitating the process of learning. At this stage, the authors also design an instrument that will be used to assess the worksheets of student that will be developed. The instruments compiled are in the form of student worksheet validation sheets and practicality sheets for teachers and students. Furthermore, the instruments that have been prepared will be validated to obtain a valid assessment instrument.

The development stage is the process of realizing the design into a problem-based student worksheet by the material and basic competency to be achieved in learning. After the initial design of the problem-based student worksheet is complete, the next stage is the validation test. The validation stage is carried out by experts who are experienced in assessing new products [27]. Validation was carried out by 3 experts in the field of Physics. If the developed product gets a valid validation value, then the student worksheet development activities have been completed. However, if the developed product gets an invalid validation value, then the developed student worksheet is revised and re-validated until the student worksheet is suitable for use.

The implementation stage is the product testing phase. The product trial is intended to collect data that can be used as a basis to reveal the practicality of PBL worksheets of student. The product practicality test was carried out limited to a small group trial, namely with the assessment of 3 physics teachers and 6 students. This practicality test was conducted at senior high school number 4 Bukittinggi, majoring in science, who had studied momentum and impulse material. The researcher explained to the students how to fill out the questionnaire and explained the problem-based student worksheet. Students are asked to see the resulting product, then students are asked to provide an assessment related to the problem-based student worksheet products that have been shown

The evaluation stage is carried out at each stage which is useful for minimizing product errors and for the feasibility of the final product. After the product design is validated by experts, and followed by product trials in small groups, the weaknesses of the product can be identified. If it is still within the criteria for use and there are suggestions during the trial, then the product will be revised according to the suggestions to produce even better products. If the feasibility shows the criteria are quite feasible, then the revised product and the improvement results will be re-tested. The trial results if the teacher and students say that the product is good and interesting, then this student worksheet has been completed and becomes the final product. If it is not perfect, then the this trial results are used as material for improvement and refinement so that the worksheets of student are ready to be used at school.

Data analysis techniques were carried out to calculate and reveal the level of product validity and practicality. The data on the validity and practicality of the PBL worksheets of student were analyzed using descriptive statistical analysis. Respondents who have responded are given a score. Then add up to find out the score. Then, to find out the value obtained for each question in each questionnaire category, the score obtained is divided by the maximum score, then multiplied by 100%. Invalid/impractical product criteria are in the 0% to 20% percentage category, the less valid/less practical product criteria are in the 21% to 40% percentage category, and the product criteria are quite valid/practical enough to be in the 41% to 40% percentage category. with 60%, valid/practical product criteria are in the percentage category of 61% to 80%, and very valid/very practical product criteria are in the percentage category of 81% to 100% [28].

III. RESULTS AND DISCUSSION

In general, there are two main results of this study. The two research results include 1) the final product and 2) the feasibility test results, namely the validity test is carried out by experts, and the practicality test is carried out by teachers and students.

1. The Final Result of Problem Based worksheets of student

The development of this problem-based student worksheet contains material in basic competency 3.10 and basic competency 4.10 about momentum and impulse for class X senior high school. In writing this student worksheet, it is adjusted to the steps in the structure of the student worksheet according to the Ministry of National Education in 2008 The structure of the student worksheet includes: front / main cover, study instructions, competencies to be achieved, supporting information, work steps and evaluation [14]. The learning steps on this student worksheet are made based on steps PBL model that consists of 1) orientation of students to problems, 2) organizing students to learn, 3) guiding individual and group experiences, 4) developing and presenting work 5) analyzing and evaluating problem solving processes [4].

The following is part of the problem-based student worksheet that has been designed: The cover on the student worksheet contains the title of the student worksheet, the UNP logo, the learning materials used, images related to the material and there is also school identity such as senior senior high school Class X. The learning instructions section contains instructions for teachers and students in working on PBL worksheets of student to make it easier for teachers and students to carry out the process of learning. In problem-based worksheets of student,several competencies containn core competencies, basic competencies, indicators, and learning objectives. The summary section of the material contains an explanation of the material regarding the subject matter in the worksheets of student in accordance with the learning objectives to be achieved so that they can assist students in carrying out the process of learning used in the worksheets of student. The activities and learning steps contain several pages that are adapted to the steps PBL model. The activities carried out refer to the steps PBL model. The following is an explanation of each of these steps. For the orientation of students to the problem of loading phenomena in everyday life related to the material to be studied. Propose phenomena to raise problems and motivate students to engage in problem solving activities. Organizing studproblem-solvingontains the student discussions results with group friends in solving questions in the problem orientation section. Guiding individual and group experiences contains experimental steps to be able to gather information. Develop and present the work containing results the information obtained based on the experiments that have been carried out. Analyzing and evaluating the problem solving process contains an evaluation of their investigations and the processes they use. After learning activities are carried out, then students will be directed to work on structured tasks. These questions are part of the exercise so that students better understand the material.

2. Feasibility Test Results

a. Product Validity Test Results

This problem-based student worksheet validation is seen from the expert validation instrument. The validation by experts results are used to reveal the feasibility of problem-based worksheets of student and guidelines for revising the product. This problem-based student worksheet was validated by 3 expert lecturers. Based on the validity assessment instrument by experts on problem-based worksheets of student on momentum and impulse material for physics learning in senior high school, there are five assessment components that are analyzed. The assessment components used are content aspects of feasibility s, presentation aspects of feasibility, language aspects of feasibility, graphic aspects of feasibility and problem-based model of learning.

The first component, the aspect of content feasibility, contains four indicators. The component plot of the feasibility of content aspect results on the problem-based student worksheet are shown in Figure 1.

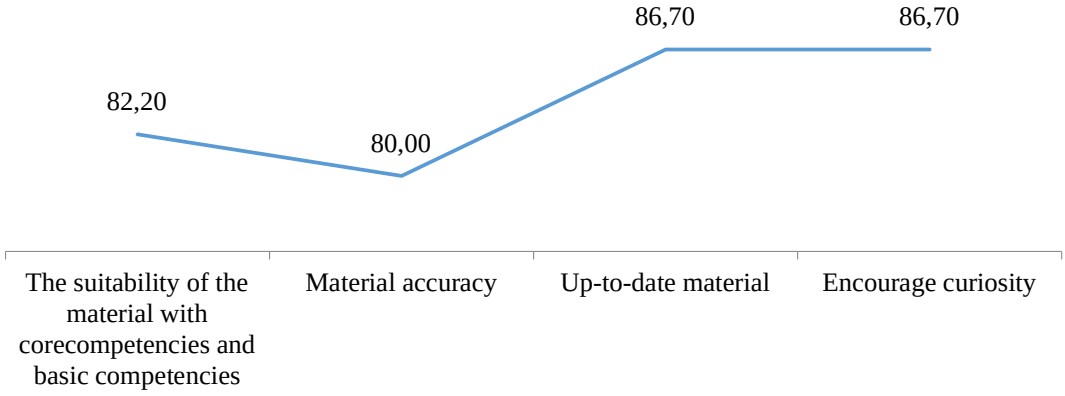

Figure 1. Validity Value on Content Aspect of Feasibility Components

Based on Figure 1, it shown that the value on the indicators of the aspects of feasibility content of problem-based worksheets of student ranges from 80.0% to 86.7%. very valid with a value range of 82.2% to 86.7%, one indicator is in the category was valid with a value of 80.0%[28]. From the four indicators, the value in average of the content feasibility component is 83.0%[28]. Therefore, the component of the aspects of feasibility of the problem- based student worksheet content is in the category was very valid [28].

The second component, the aspect of presentation feasibility assessment, there are four indicators. The component plot result of the aspect of feasibility on presenting the problem-based student worksheet are shown in Figure 2.

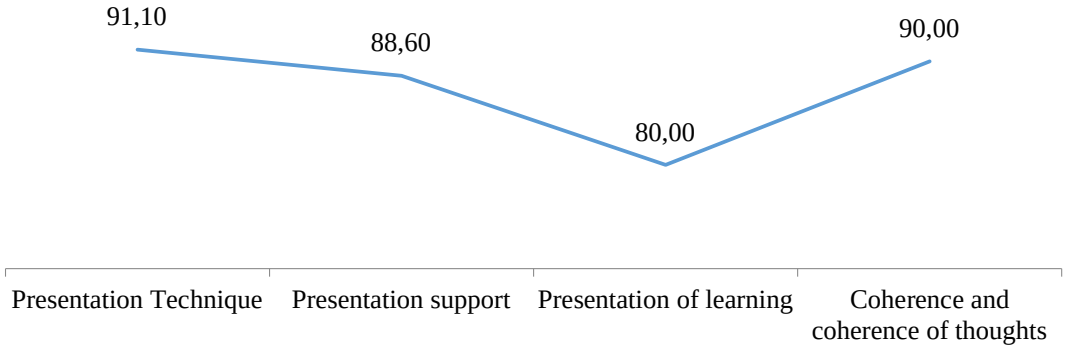

Figure 2. Value of Validity on the Components of the Aspects of Feasibility of Presentation

Based on Figure 2, it shown that scores on the indicators of aspects of feasibility presenting problem-based worksheets of student ranged from 80.0% to 91.1%. Based on four indicators on the component of the aspects of feasibility of presentation in problem-based worksheets of student, three indicators are in the category was very valid with a value range of 88.6 to 91.1%, one indicator is in the category was valid with a value of 80.0%[28]. From the four indicators, it can be reveal that the value in average of the components of the presentation aspects of feasibility is 88.1%[28]. Therefore, the components of the aspects of feasibility of presenting problem-based worksheets of student are in the category was very valid [28].

The third component, namely the aspect of language feasibility assessment, there are three indicators. The results of the component plot of the language aspects of feasibility on the problem-based student worksheet are shown in Figure 3.

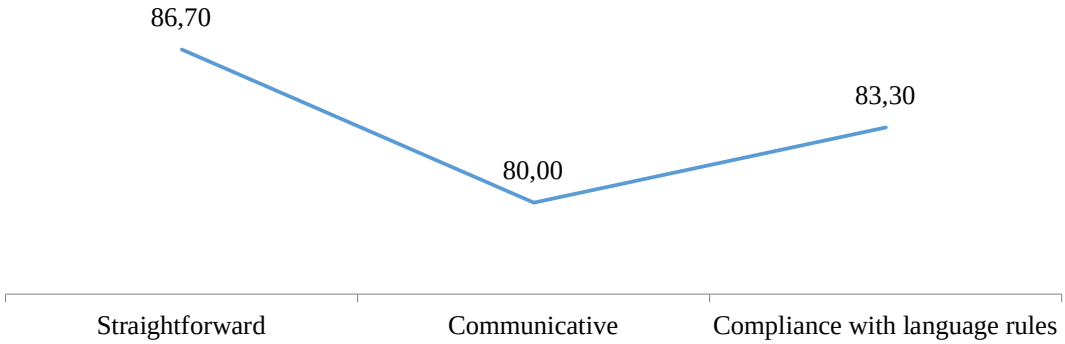

Figure 3. Value of Validity on the Components of the aspects of feasibility of Language

Based on Figure 3, it shown that scores on indicators of language aspects of feasibility of problem- based worksheets of student ranged from 80.0% to 86.7%. Based on three indicators on the aspects of feasibility components language in PBL worksheets, twoo indicators are in the category was very valid with a value range of 83.3% to 86.7%, one indicator is in the category was valid with a value of 80.0%[28]. From the three indicators, it can be revealed that the value in average of the components of the language aspects of feasibility is 84.4%[28]. Therefore, the components of the language aspects of feasibility of problem-based worksheets of student are in the valid [28].

The fourth component, namely the aspect of assessing the feasibility of graphics, there are three indicators. The results of the plot of the component aspects of the feasibility of graphics on PBL worksheets of student are shown in Figure 4.

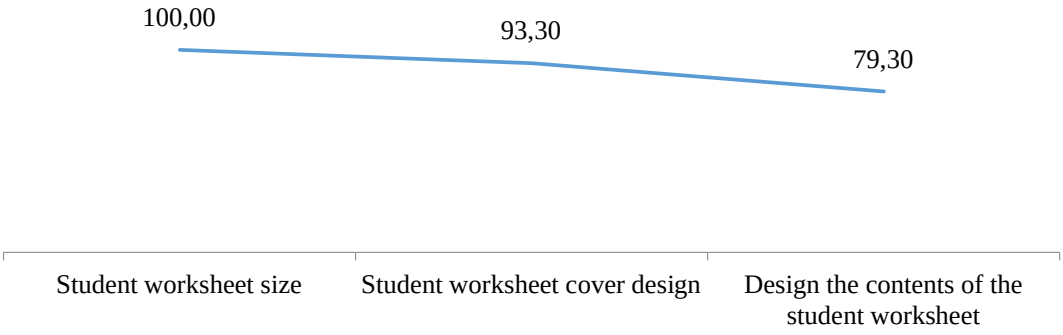

Figure 4. Value of Validity on Components of aspects of feasibility s of Graphics

Based on Figure 4, it shown that score on indicators of aspects of feasibility of problem-based worksheets of student ranges from 79.3% to 100%. Based on three indicators on the aspects of feasibility in the PBL worksheets, two indicators are in the valid with a value range of 93.3% to 100%, one indicator is in the category was valid with a value of 79.3%[28]. From the three indicators, it can be revealed that the value in average of the components of the aspects of feasibility of graphics is 83.1%[28]. Therefore, the component of the aspects of feasibility of problem-based worksheets of student is in the category was very valid [28].

The fifth component, namely the assessment aspect of the problem-based model of learning, the indicators contain a steps PBL modelwith six assessment points. The results of the problem-based model of learning assessment plot on the problem-based student worksheet are shown in Figure 5.

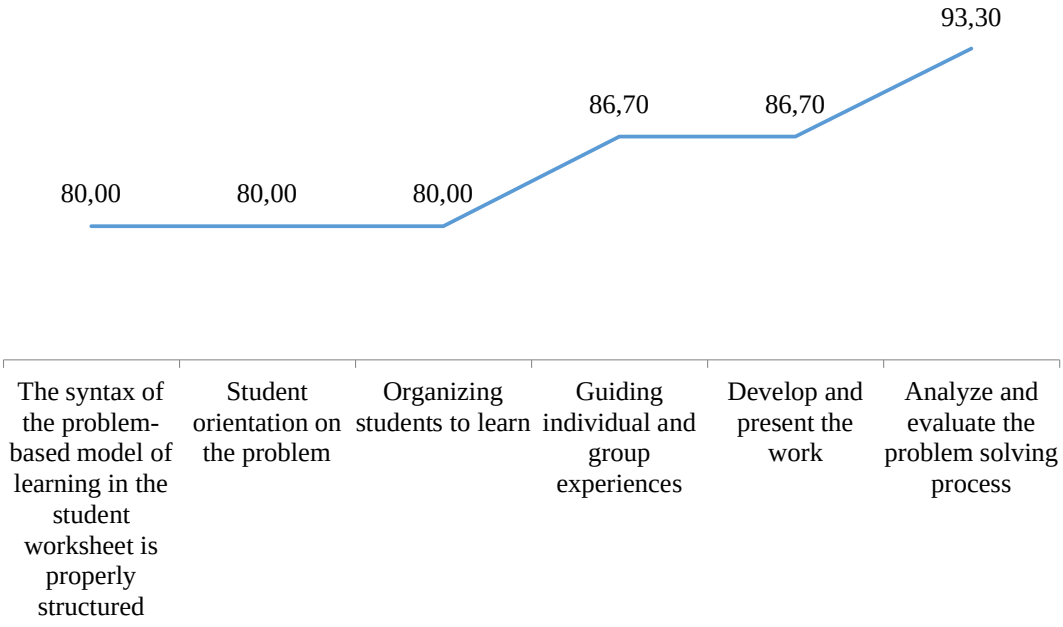

Figure 5. Value of Validity on Components of Problem-Based Model of Learning

Based on Figure 5, it shown that the value of the PBL model component on the problem-based student worksheet ranges from 80.0% to 93.3%. Based on the six assessment points in the PBL model, three indicators are in the category was very valid with a value range of 86.7% to 93.3%, three indicators are in the category was valid with a value of 80%[28]. From the six assessment items, it can be revealed that the value in average of the PBL model assessment in the worksheets of student is 84.4%[18]. Therefore, the assessment of PBL models in PBL worksheets of student is in the category was very valid [28].

The value in average obtained from each component of the problem-based student worksheet assessment on momentum and impulse material for physics learning in senior high school can be revealed from the average of the five components of the student worksheet validity assessment carried out by experts who have been analyzed seen in Table 1.

Table 1. Analysis of the value in average of Problem-Based Student Worksheet Validity

No.	Component Validity	Validator	Average	Category

		V1	V2	V3	Score	
1	Content Eligibility	90,9%	80,0%	78,2%	83,0%	Very Valid
2	Serving Eligibility	91,4%	81,4%	91,4%	88,1%	Very Valid
3	Language Eligibility	83,3%	80,0%	90,0%	84,4%	Very Valid
4	Graphic Eligibility	90,8%	81,5%	76,9%	83,1%	Very Valid
5	Problem-Based Model of Learning	83,3%	76,7%	93,3%	84,4%	Very Valid
Average Overall Validity Score					**84,6%**	**Very Valid**

From the table above, it can be concluded that the value in average of the validity of the worksheets of student given by three experts (validators) is 84.6% in the category was very valid [28].

b. The results of the Practicality Test of Problem-Based worksheets of student

The practicality test of this problem-based student worksheet was carried out by the Physics Teacher of senior high school number 4 Bukittinggi and students. The number of teachers who assessed the practicality of problem-based worksheets of student were three and six students.

1) Practical Results of worksheets of student from Teachers

The results of the practicality test of problem-based worksheets of student by the teacher were analyzed based on the problem-based student worksheet instruments made. The results of the practicality test of problem-based worksheets of student consist of three aspects of assessment. The three aspects of the assessment are the ease of use of worksheets of student, attractiveness of worksheets of student, and efficiency of worksheets of student.

The first component, the ease of use of worksheets of student. The plot results can be seen in Figure 6.

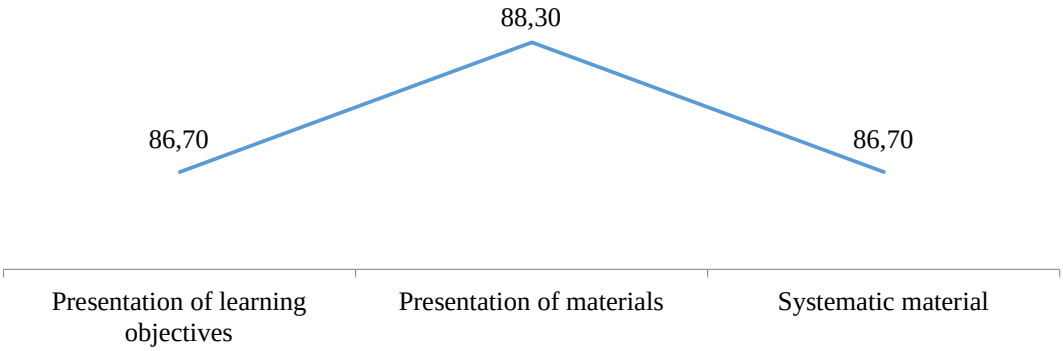

Figure 6. Practical Value of the Ease of Use of Worksheets Of Student

Based on Figure 6, it can be seen that the components of the ease of use of worksheets of student, all indicators are in the category was very practical with a value range of 86.7% to 88.3%. From the three indicators, it can be revealed that the value in average of the ease of use of students' worksheets is 87.8%. Therefore, the component of ease of use of problem-based worksheets of student is in the category was very practical [28].

The second component, the attractiveness of Worksheets Of Student. The plot results can be seen in Figure 7.

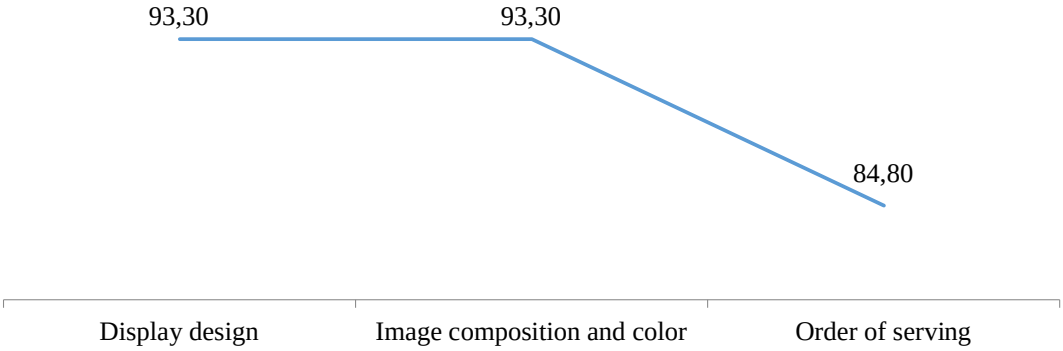

Figure 7. The Value of Practicality on the Attractiveness Component of Worksheets Of Student

Based on Figure 7, it can be seen that the attractiveness component of problem-based worksheets of

student, all indicators are in the category was very practical with a value range of 84.8% to 93.3%. From the three indicators, it can be revealed that the value in average of the attractiveness component of the worksheets of student is 86.7%. Therefore, the attractiveness component of problem-based worksheets of student is in the category was very practical [28].

The third component, the efficiency of worksheets of student. Theplot results can be seen in Figure 8.

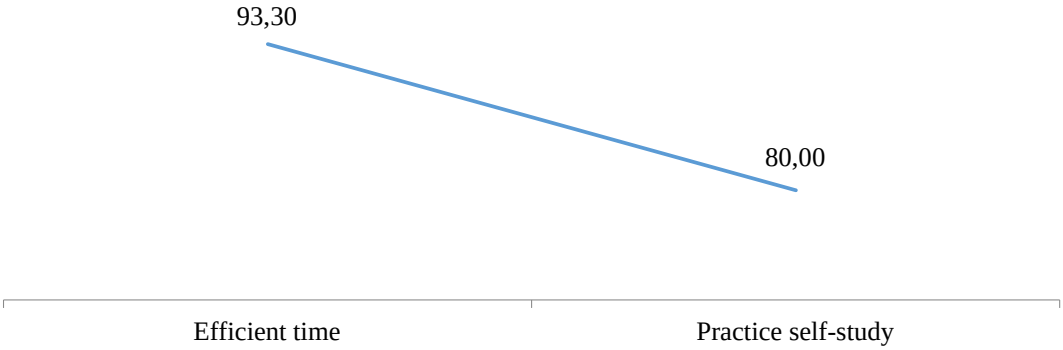

Figure 8. The Value of Practicality on the Efficiency Component of the Student Worksheet

Based on Figure 8, it shown that the efficiency component of the problem-based student worksheet, one indicator is in the category was very practical with a value range of 93.3% and one indicator is in the practical category with a value range of 80.0%. From the two indicators, it can be revealed that the value in average of the efficiency component of the students' worksheets is 90.0%. Therefore, the efficiency component of problem-based student worksheets is in the category was very practical [28].

The value in average obtained from each component of the problem-based student worksheet assessment on momentum and impulse material for physics learning in senior high school can be revealed from the average of the three components of the practicality assessment of student worksheets by the teacher that has been analyzed, which can be seen in Table 2.

Table 2. Analysis of the Average Practicality of Problem-Based Worksheets of Studentby Teachers

No.	Practical Component	Practitioner			Average Score	Category
		P1	P2	P3		
1	Ease of use	93,3%	83,3%	86,7%	87,8%	Very Practical
2	Attractiveness	88,9%	84,4%	86,7%	86,7%	Very Practical
3	Efficiency	90,0%	90,0%	90,0%	90,0%	Very Practical
Average Overall Practicality Score					**88,17%**	**Very Practical**

From the table above, it can be concluded that the value in average of the practicality of worksheets of student given by three teachers, namely 88.1%, is in the category was very practical [28].

2) Practical Results of worksheets of student from Students

The results of the practicality test of problem-based worksheets of student by students were analyzed based on the problem-based student worksheet instruments made. The results of the practicality test of problem-based worksheets of student consist of three aspects of assessment. The three aspects of the assessment are the ease of use of worksheets of student, attractiveness of worksheets of student, and efficiency of worksheets of student.

The first component, the ease of use of worksheets of student. The plot results can be seen in Figure 9.

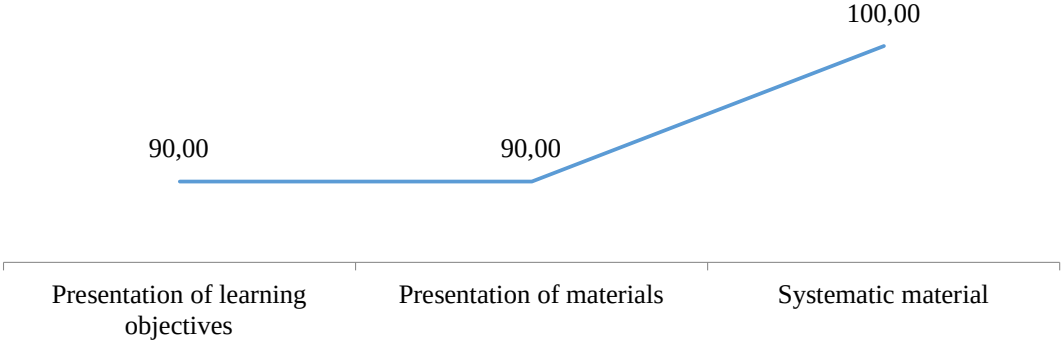

Figure 9. Practical Value of the Ease of Use of worksheets of student

Based on Figure 9, it shown that the component of ease of use of problem-based worksheets of student, all indicators are in the category was very practical with a value range of 90.0% to 100.0%. From the three indicators, it can be revealed that the value in average of the ease of use of students' worksheets is 91.7%. Therefore, the component of ease of use of problem-based worksheets of student is in the category was very practical [28].

The second component, the attractiveness of worksheets of student. The plot results can be seen in Figure 10.

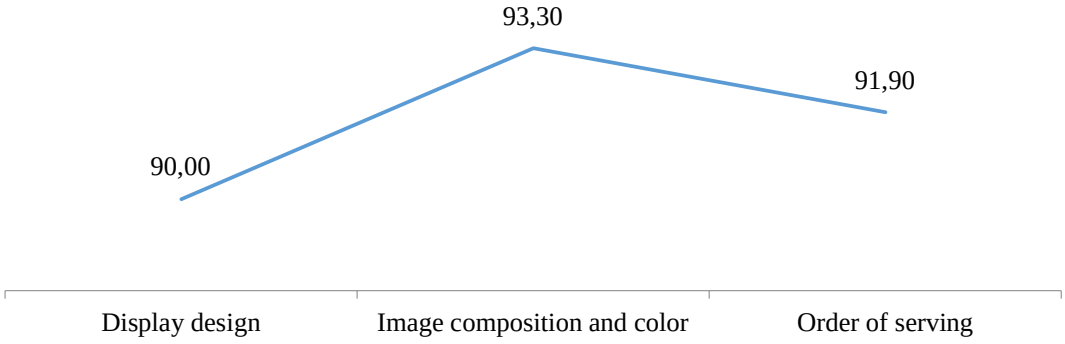

Figure 10. The Value of Practicality on the Attractiveness Component of worksheets of student

Based on Figure 10, it shown that the attractiveness component of problem-based worksheets of student, all indicators are in the category was very practical with a value range of 90.0% to 93.3%. From the three indicators, it can be revealed that the value in average of the attractiveness component of the student worksheet is 91.9%. Therefore, the attractiveness component of problem-based worksheets of student is in the category was very practical [28].

The third component, the efficiency of worksheets of student. The plot results can be seen in Figure 11.

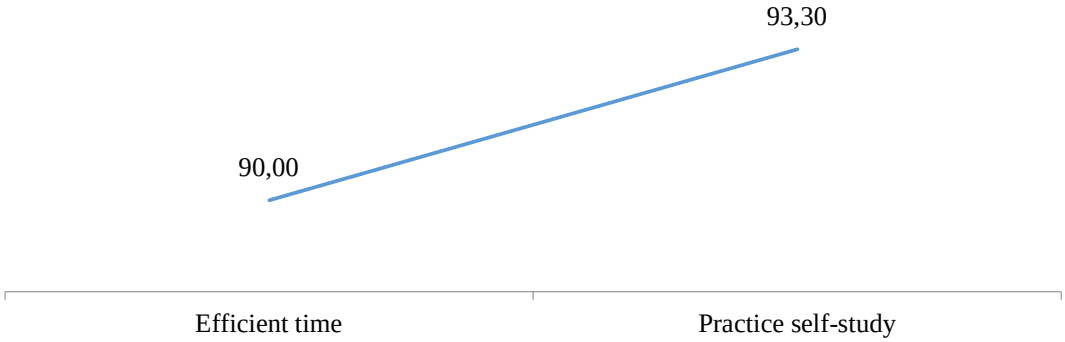

Figure 11. The Value of Practicality on the Efficiency Component of the Student Worksheet

Based on Figure 11, it shown that the components of the efficiency of the problem-based worksheets of student, all indicators are in the category was very practical with a value range of 90.0% to 93.3%. From the two indicators, it can be revealed that the value in average of the efficiency component of the students' worksheets is 90.8%. Therefore, the efficiency component of problem-based worksheets of student is in the category was very practical [28].

The value in average obtained from each component of the problem-based student worksheet assessment on momentum and impulse material for senior high school / MA physics learning can be revealed from the average of the three components of the practicality assessment of worksheets of student by students who have been analyzedcan be seen in Table 3.

Table 3. Analysis of the Average Practicality Value of Problem-Based worksheets of student by Students

No.	Practical Component	Practitioner						Average Score	Category
		P1	P2	P3	P4	P5	P6		
1	Ease of use	93,3%	93,3%	90,0%	96,7%	86,7%	90,0%	91,7%	Very Practical
2	Attractiveness	93,3%	91,1%	91,1%	95,6%	88,9%	91,1%	91,9%	Very Practical

3	Efficiency	90,0%	95,0%	85,0%	100,0%	90,0%	85,0%	90,8%	Very Practical
Average Overall Practicality Score								**91,47%**	Very Practical

From the table above, it can be concluded that the value in average of the practicality of worksheets of student given by six students is 91.47% in the category was very practical [28].

From the results of data analysis, the validity and practicality of problem-based worksheets of student are suitable for use in the Physics process of learning.

The advantages of problem-based worksheets of student according to the teacher are that they can make students more active in learning and make it easier for teachers to teach. In line with the opinion [29] problem-based physics LKPD is very helpful for teachers in learning in class The advantages of worksheets of student according to students are that they can facilitate students in learning, can learn to be independent and active, optimize mindset and learning time can be more efficient. In line with the opinion [12] the advantages of worksheets of student are: 1) worksheets of student to activate students in learning activities. 2) Helping students to find and develop concepts. 3) Become an alternative way of presenting subject matter that emphasizes the activeness of students. 4) And can motivate students.

Some advantages for students in learning using problem-based models: 1) the ability to remember is better 2) develop problem solving skills, critical thinking and communication skills 3) enjoy learning 4) motivation increases 5) group work becomes good and 6) learning strategies develop[30]. In accordance with research conducted by [31] which shows that there is an effect of problem solving skills through the PBM model.

In this study, several limitations and constraints were found. The limitations and constraints faced consist of two aspects that are deemed necessary to know and find a solution. The first obstacle is that the problem-based worksheets of student developed are still limited, namely only one basic competency in the material for class X senior high school and the second obstacle is that the product quality test is still only limited to small group trials. The obstacles faced can be explained in terms of the causes and the best solutions to get even better results in the future.

The first obstacle is that the problem-based worksheets of student developed are still limited, namely only one basic competency in class X material. This is due to the limited time of researchers to design problem-based worksheets of student. An alternative solution is to further develop the scope of basic competency for grade X senior high school in order to produce a complete problem-based student worksheet.

The second obstacle is product quality testing is still limited to small group trials. This is due to the limited time of the researcher. An alternative solution that can be done is that other researchers can continue to the effectiveness stage.

IV. CONCLUSION

Some conclusions can be drawn from the results of research and discussion that have been carried out, as follows:1) The worksheets of student produced are in accordance with the designs made and have a structure that was prepared based on the 2008 Ministry of National Education based on PBL models in learning activities. 2) The feasibility of problem-based worksheets of student on momentum and impulse material for physics learning in senior high school in terms of the validity test is in the category was very valid with the value in average of student worksheet validation from experts is 84.6% and the in terms of practicality by the Physics teacher, it is in the category was very practical with an value in average of 88.17% and the practicality test by students is in the category was very practical with an value in average of 91.47%.

The researcher suggests that other researchers can further develop the scope of basic competencies for class X in order to produce a complete problem-based student worksheet. In addition, it is hoped that other researchers can continue their research until the effectiveness test stage.

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