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Problem Based Learning Model For Increasing Problem Solving Skills In Physics Learning

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ABSTRACT
The role of creativity in learning is more associated with problem-solving activities, meaning that creativity is measured through the ability of students to approach and solve problems. However, the PBL model has not been implemented optimally by the teacher, so that the problem solving ability and learning achievement of students have not been optimally stimulated. This research study is proposed to develop a model of Problem-Based Learning to stimulate the improvement of the skill of problem solving in physics learning for students of Senior High School. The development of Problem-Based Learning model for physics learning applied the ADDIE model. The form of observation sheets, questionnaires and question sheets were used as the instrument of data collection. The product was validated by the experts and tested on the eleventh grade students of SMA 9 Padang with a value of 3.85 very valid categories.The practicality of the learning model was determined by the implementation of learning, teacher's response and students' response with a value of 3.73 with category done. The effectiveness of the learning model was determined by student activities, problem solving skills and knowledge aspect. show that Asymp.C. 001 <0.05 means that Ho is rejected. The research has found a Problem-Based Learning model for physics learning which is abbreviated with the problem based learning model to physics learning (PBL-PL) . The findings indicated that the Problem-Based Learning model can stimulate the improvement of students' problem solving skills for Physics learning in Senior High School. For this reason, it is recommended for the teachers and prospective teachers to apply the Problem-Based Learning model for Physics learning in Senior High School.

INTRODUCTION

The modern competitive environment increasingly demands individuals and organizations to develop in order to remain successful. This is especially true for educators who are challenged to not only maintain their own relevance and abilities, but must also develop the same thing in their students [1]. The main points of education are not to teach reading, writing or arithmetic, but to teach how to use thinking skills such as not only creativity but also quality problem solving skills, ability to understand literacy and scientific and technological processes [2]. The role of creativity in learning is most often associated with problem-solving activities, which means creativity is measured by students' ability to approach problems in new ways [3]. Problem-based learning provides the conditions for improving critical thinking and analysis skills, as well as solving complex problems in real life [4]. In the modern world, to increase students' capacity to solve problems and critical thinking is presented as an educational goal in all fields [5].

In the 21st Century Partnership Learning Framework there are a number of competencies or expertise that must be possessed by 21st century human resources (1), the ability to think critically and solve problems (critical thinking and problem solving skills) capable of thinking critically, laterally and systemic especially in the context of problem solving. (2) The ability to create and update (Creativity and Innovation skills). Able to develop the creativity he has to produce innovative breakthroughs.(3)Information and communication technology literacy, capable of utilizing information and communication technology to improve performance and daily activities. (4) Contextual Learning Skills (Contextual Learning Skills), Able to undergo contextual independent learning activities as part of personal development. (5) The ability of information and media literacy (Information and Media literacy skills) Able to understand and use communication media to convey various ideas and carry out collaborative activities and interactions with various parties. Technological Progress has changed the style of teaching and learning activities from passive learning to active learning, ranging from traditional teaching to contemporary innovative teaching, and produces students from passive listeners to active students, especially in science learning.

Physics is a branch of science that provides important and meaningful contributions to the development of science, especially in applied sciences such as technology, engineering, health, and marine, therefore physics is an important subject in senior high school. But based on the facts in the field and studies of several studies that physics is difficult. Physics is not only difficult for students to understand but students also consider how to find solutions to solve problems related to Physics as complex subjects [6]. Teachers are another reason for students' difficulties in studying Physics because of their active role in the teaching and learning process [7]. students think that teachers play an important role for them to understand and like learning physics [8]. suggested in a study that one of the possible causes of difficulties in understanding Physics for students is non-experimental and theoretical treatment of the subject [9]. The teachers take an important task to manage the teaching process of the lesson well [10]. this requires more serious attention from various groups in order to find alternative solutions. To improve students' abilities and competencies in learning especially Physics [11].

Problem Based Learning is one alternative to help students to be trained in solving problems in learning physics [12]. The advantages of the Problem Based Learning (PBL) model are a learning model that encourages to be more active and maximize the ability to think critically to find solutions to real-world problems and the ability to challenge students and provide satisfaction to find new knowledge for students. It makes it easier for students to master concepts -concepts that study in order to solve real world problems. The application of problem based learning models can improve students' physics learning problem solving skills. The essence of problem-based learning is to provide a variety of authentic and meaningful problematic situations to students, which can serve as a stepping stone for investigations and investigations so as to improve problem solving skills in students Based on this description, in this study a learning model was developed, namely the Problem Based Learning model for Physics Learning in High School [13]. This model is expected to improve students' problem solving skills and high school student learning outcomes [14]. The purpose of this study is the purpose of this study is to develop a problem-based learning model to stimulate an increase in problem skills in high school physics learning. And the novelty of this research is this model provides opportunities for students to play an active role in finding productive and effective methods and building basic knowledge and the basis of this problem is the addition of syntax in the first and third steps.

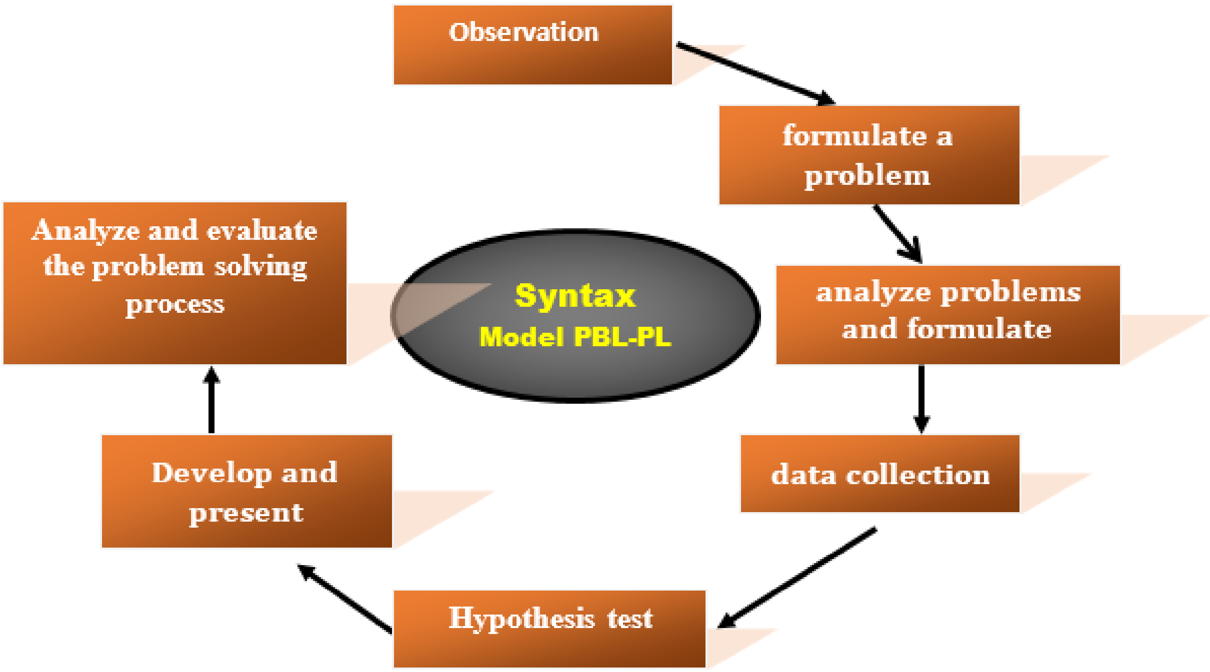

Fig 1. *Syntax Problem Based Learning Model For Learning Physics*

METHOD

The type of the research is research and development. The development model used is ADDIE. It is one of the systematic learning design models, chosen based on the consideration of this model is developed systematically and rests on the theoretical foundation of learning design. This model is structured programmed with sequences of systematic activities in efforts to solve learning problems related to learning resources that are in accordance with the needs and characteristics of students. This model consists of five step, namely: (1) analyze, (2) design, (3) development, (4) implementation, and (5) evaluation. Visually the ADDIE Model steps can be seen in Figure 2.

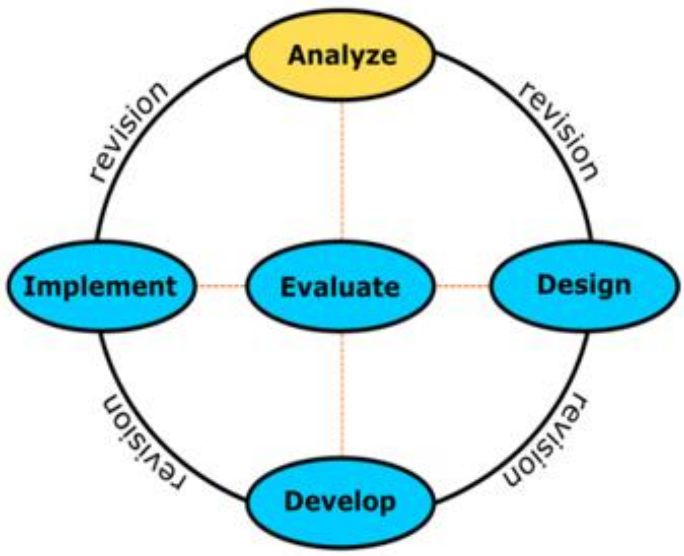

Fig 2. *Core Elements of ADDIE Model*

The form of observation sheets, questionnaires and question sheets were used as the instrument of data collection. The product was validated by the experts and tested on the eleventh grade students of SMA 9 Padang which have implemented the 2013 Curriculum. Questionnaires and test sheets were used to obtain quantitative data. Observation, response, and written suggestion were used to obtain qualitative data. The practicality of the learning model was determined by the implementation of learning, teacher's response and students' response. The effectiveness of the learning model was determined by student activities, problem solving skills and knowledge aspect. Data of the implementation of learning and product effectiveness were obtained through experimental research with randomized control-group pretest-posttest design. The limited experiments were conducted in SMA 9 Padang. The extended experiment was conducted in SMA 8 Padang and SMA 9 Padang. Data validity is viewed from the construct or content, language and design, practicality in terms of product use and activity were analyzed using the Cohen's kappa formula and percentage. The Data on the improvement of problem solving skill and aspect of knowledge were analyzed through *t test* using *SPSS* assistance.

RESULTS AND DISCUSSIONS

The results of this study indicate that student activities in Physics learning using problem-based learning models, are in a very active category both for problem solving activities, activities in groups and activities in scientific attitudes. The percentages of agreements between the two observers is 84% or in the category of very good aggrement. In accordance with predetermined criteria, the learning model is said to be effective if the students' activities meet the criteria (quite active-very active), this means that the problem-based learning model for Physics learning is effective in terms of student activities. At the design stage in designing products in the form of teacher books, student books and model books by paying attention to the component aspects of the model. The develope stage (development) which consists of: a. Designing a prototype, b. Conduct formative evaluation and c. Revision of the prototype. The implementation stage is carried out through limited trials. The limited trial is a preliminary qualitative evaluation of the product to be produced which focuses on the aspects of the content, not the outcomes, so that the supporting devices and products that have been qualitatively arranged are in a good category, and can be applied. The evaluation phase was carried out through trials in two SMA N in the city of Padang, namely SMA 9 Padang and SMA 8 Padang. The evaluation stage is carried out to obtain practicality data from the effectiveness of the model. The purpose of this evaluation is to see to what extent the level of application and application of the developed learning model.

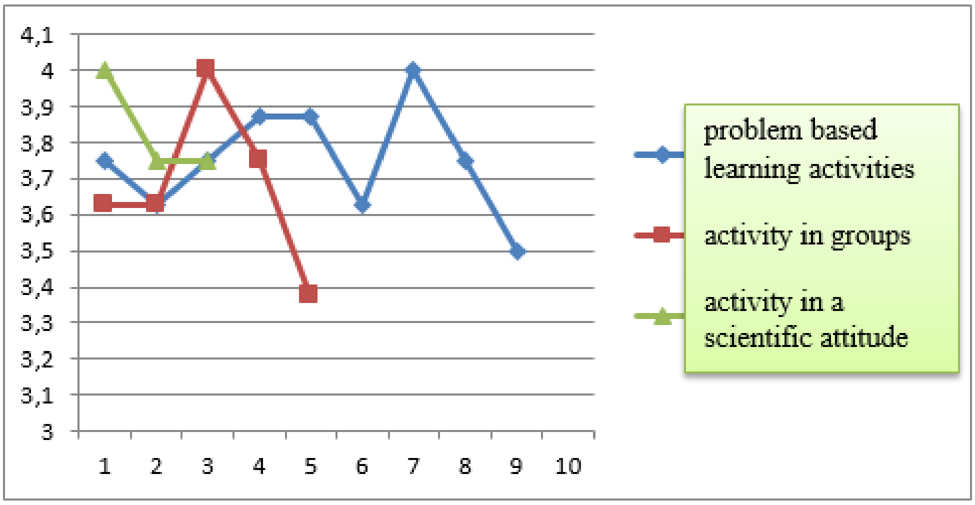

Fig 3. *Average Value of The Problem Solving Skill Activities of Number 9 Padang High School Students*

Next in Figure 4 displays the activity of problem solving skills of students of SMAN 8 Padang using the student worksheets that have been developed.

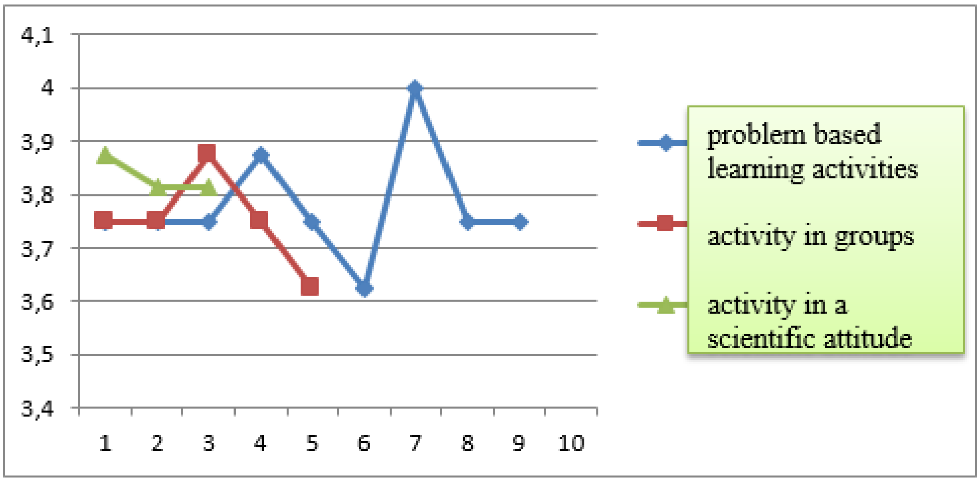

Fig 4. *The Average Value of The Problem Solving Skill Activities of 8 High School Students In Padang*

Results of analysis of Problem Solving Skills

The effectiveness test of the problem based learning model for physics learning is the result of learning in the form of problem solving skills. Problem solving skills are tested after students follow learning using a problem based learning model.

Tabel 1 . Average Learning Outcomes of Student Problem Solving Skills

School	Class	N	Average Pre test	Average Post test	Average Gain (Δ)
SMA N 8	Experiment	30	43	86	0,70
	Control	30	40	65	0,60
SMA N 9	Experiment	30	39	90	0,73
	Control	30	41	58	0,61

Based on Table 1 it can be seen that the improvement in student learning outcomes in Problem Solving skills with the problem based learning model is higher than the learning model commonly used by teachers. Then the analysis prerequisite test is carried out. The analysis prerequisite test is conducting a normality test using the Mann-Whitney and Shapiro-Wilk test.

Table 2. Analysis Results of Experiment Class and Control Class Normality Test

Class	Kolmogrov-smirnov[a]			Shapiro-Wilk		
	statistic	df	Sig.	statistic	df	Sig.
Experiment	.324	20	.250	.948	20	.398
Control	.253	20	.250	.961	20	.228

Data processing show the significance of the experimental class 0,250> 0.05 and for the control class 0,150> 0.05, meaning that the data for both classes are normally distributed. Next in Table 4, the homogeneity variance test results are displayed.

Table 4 . Homogeneity Test Results Analysis of Variance Data Skills Problem solving

Levene Statistic	df1	df2	Sig.
3.177	1	12	.100

Homogeneous variance criteria if sig> α. The results of data processing showed the significance obtained 0, 100> 0.05, meaning that the data variance increased aspects of homogeneous student knowledge.

Homogeneous variance criteria if significance> α. So it can be concluded that the data is homogeneous.

Table 5. Conclusion Test for Normality and Homogeneity of Data Variance Improved Problem Solving Skills

Class	Normality test	Homogeneity test	Hypothesis testing
Experiment	Normal distribution	Homogeneous	T tes
Control	Normal distribution		

Based on the results of the normality test and the variance homogeneity test, the hypothesis test uses the t test using SPSS 19. The results of the t test for problem solving skills are shown in Table 6.

Table 6. Test Results t Enhance Aspects of Problem Solving Skills

	Levene's test for equality of variance		t-test for equality of means		
	F	Sig.	T	df	Sig.(2-tiled
Equal variance assumed	3.165	.100	4.30	58	.001
Equal variance not assumed			4.20	7.800	.003

The Ho criterion is rejected if the significance (Asymp. C) <α. The results of the analysis in Table 6 show that Asymp.C.001 <0.05 means that Ho is rejected. This means that increasing the problem solving skills of students taught with the problem based learning model for learning Physics is better than increasing the problem solving skills not taught with the problem based learning model. Furthermore, in Figure 5, a gratification test of the effectiveness of the problem-based learning model is shown, for Physics learning towards improving students' Problem Solving skills in each of the sample schools.

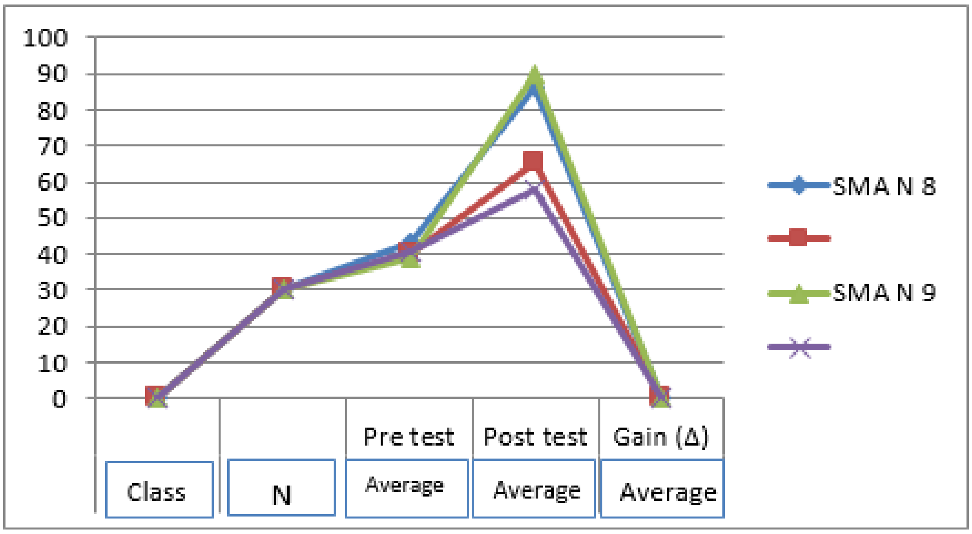

Fig 5. *Pre-Test And Post-Test Of Each Sample*

Based On The Data Shown In Figure 5, It Appears That In General There Is An Increase In Problem Solving Skills After Learning In The Two Pilot Schools

The results of the analysis of the data aspects of knowledge

The effectiveness test of the problem based learning model for physics learning is the result of learning in the aspect of knowledge. Knowledge aspects were tested after students followed the learning using problem based learning models.

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Table 7. Average Learning Outcomes Aspect of Knowledge

School	Class	N	Average Pre test	Average Post test	Average Gain (Δ)
SMA N 9	Experiment	30	53	90	0,78
	Control	30	30	75	0,63
SMA N 8	Experiment	30	52	85	0,74
	Control	30	27	75	0,60

Based on Table 7, it appears that an increase in learning outcomes in aspects of student knowledge with problem-based learning models for learning that teachers commonly use. Then the analysis prerequisite test is carried out. The analysis prerequisite test is conducting a normality test using the t test.

Table 8 . Results of Data Normality Test for Increasing Knowledge Aspects

Class	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Experiment	.161	30	.163	.777	30	.094
Control	.217	30	.200*	.833	30	.086

*. This is a lower bound of the true significance.

[a]. Lilliefors Significance Correction

Criteria for data are normally distributed if significance> α. The results of data processing showed significance in the experimental class 0.163> 0.05 and for the control class 0.200> 0.05, meaning the data for the two classes were not normally distributed.

Table 9. Analysis of Homogeneity Test Results for Data Aspect Knowledge Aspects

Levene Statistic	df1	df2	Sig.
.163	1	12	.294

Homogeneous variance criteria if sig> α. The results of data processing showed the significance obtained 0.294> 0.05, meaning that the data variance increased aspects of homogeneous student knowledge.

Table 10. Conclusion Normality and Homogeneity Data Test Increased Knowledge Aspect

Class	Normality test	Homogeneity Test	Hypothesis testing
Experiment	Normally distributed	Homogeneous	t-test
Control	Normal distributed		

Based on the results of the normality test and the variance homogeneity test, the hypothesis test uses t. The hypotheses tested are as follows: Ho = the knowledge competence of students taught by the problem based learning model for physics learning is significantly different from the knowledge competence of students who are not taught with the problem based learning model. The stalistic hypothesis is written as follows: Ho: µ1 - µ2 Hypothesis testing uses the t test with the help of SPSS;

Tabel 11 . Test Results For Aspects of Knowledge Test Result Table Increased Knowledge Aspect

	Levene's Test for Equality of Variances		t-test for Equality of Means				
	F	Sig.	t	df	Sig. (2-tailed)	95% Confidence Interval of the Difference	
						Lower	Upper
Equal variances assumed	3.227	.100	4.010	58	.001	15.043	40.513
Equal variances not assumed			4.001	7.800	.003	13.952	41.204

The Ho criterion is rejected if the significance (Asymp. Sig) <α. The analysis results obtained by Asymp. Sig .000 <0.05 means Ho is rejected. This means that increasing the competency of students' knowledge taught by the problem-based learning model for physics learning is better than increasing the knowledge competence of students who are not taught with the problem-based learning model. In Figure 6, the effectiveness of the problem-based learning model for physics learning graphs is displayed on the improvement of students' knowledge competency in each of the Sample schools.

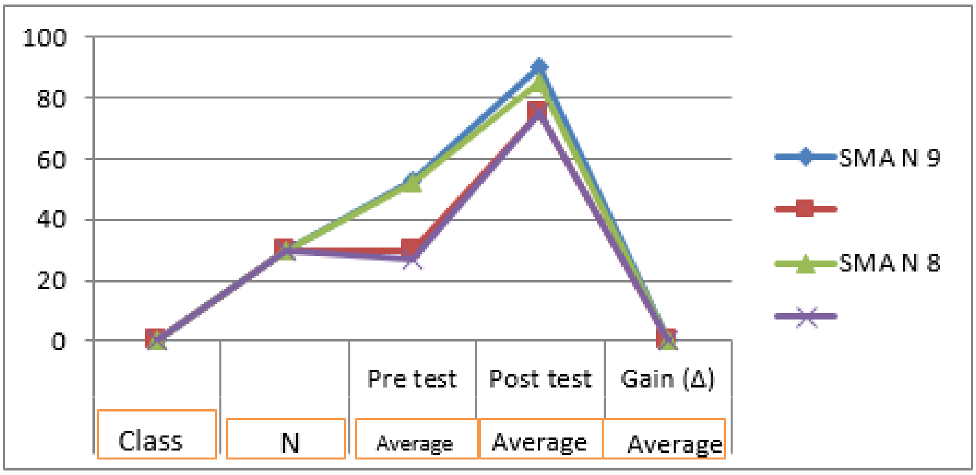

Fig 6. *Improving Student Knowledge Competencies*

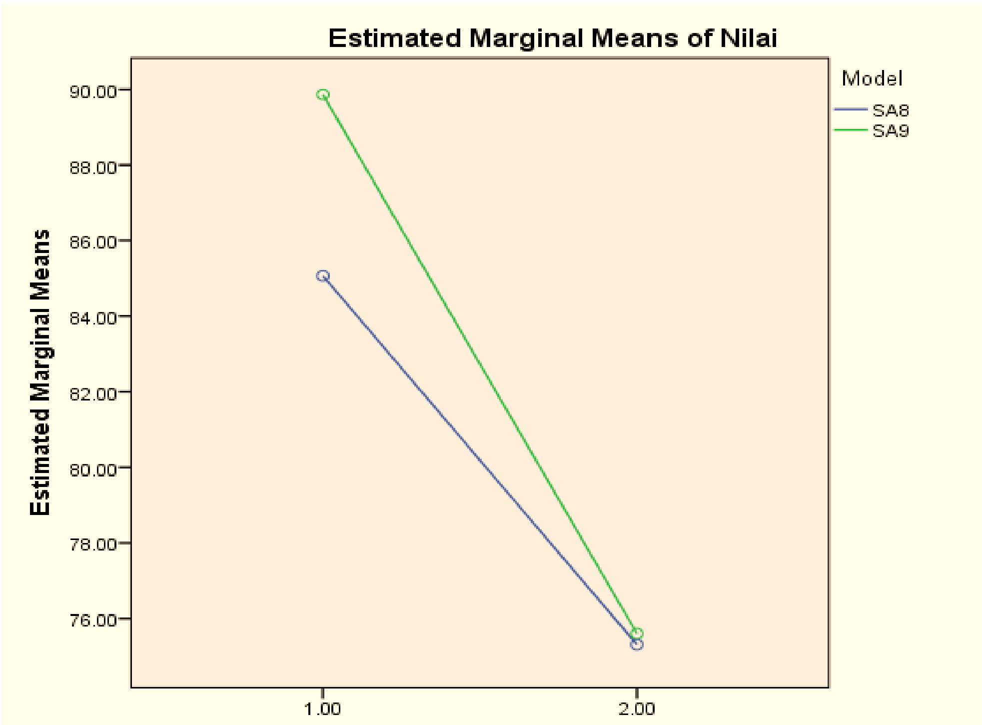

Fig 7. *Interaction Test Results (two way ANOVA) Knowledge competence of students in Padang 9 and SMA 8 Padang*

The criteria set out to state the problem based learning model for effective physics learning are: (1) student activities are in the moderately to very active category (2) increased learning outcomes in the higher aspects of knowledge than students in the control class, and (3) increased outcomes learning Problem Solving skills is higher than students in the control class. Based on this, the problem-based learning model for learning Physics is effective when determined in learning. Where the increase in learning outcomes both for knowledge competence and problem solving skills is higher than the control class, and student activities are in the very active category. To see whether there is an interaction between the application of the PBM-PL model with student learning outcomes on aspects of knowledge at schools at different levels, then after testing the hypothesis a two-way ANOVA test is conducted. The results of the analysis show that there is an interaction between PBM-PF models and student activities ($F = 61.759$; $p < 0.01$) The results of the two-way ANOVA test are reinforced by a picture that shows the existence of interactions that can be seen in Figure 7. From Figure 7, there is a crossing line between both lines, this data shows that there is an interaction between the application of the PBM-PL model with learning outcomes on aspects of student knowledge at different levels of schooling. The meaning of the PBM-PL model can be applied in all schools, both middle and low level.

From the discussion of the results of the study it can be concluded as follows:

1. The validity category of the model is very valid with a value of 3.85. The validity of the problem based learning model along with the teacher's book and student's book Obtained a learning model and its support system in the form of a teacher's book, a valid student book. The validity of the model in terms of several aspects namely the component content aspects and the principles and characteristics of the model development. As for the structure of the model in terms of organization, format, and language used. For the results of teacher and student book validation in terms of organizational aspects, format, aspects of the translation of material or content, use of language and illustrations or pictures.
2. The practicality of the problem based learning model along with the teacher's book and student's book with a score of 3.73 with the implemented category
   The prototype of the problem-based learning model along with the teacher's book and student's book is already practical according to observers, teachers and students. This shows that the model can be implemented well and the learning process does not occur significant problems or run in normal situations. For teachers with a teacher's book along with a model guide book can help the learning process. In general students like to follow the learning process by using student books with the application of problem based learning models. As a whole, it can be stated that the problem-based learning model contains authentic assessment, the teacher and student books are easy to use, easy to understand, useful, and interesting.
3. Effectiveness of the problem based learning model along with the teacher's book and student's book The effectiveness observed in the implementation of this learning activity, aspects of knowledge, and problem solving skills of students. Based on the results of data analysis and discussion obtained:
   a. Activities and knowledge of students during the learning process develops well.
   b. Towards the development of students' problem solving skills, it can be concluded that there are differences in problem solving abilities (communication skills, problem solving skills, and reasoning abilities) students who are taught with problem based learning models and students who are taught with conventional learning. These differences indicate that critical thinking skills (visualization / problem description, physical approach, using special applications of physics concepts, carrying out mathematical procedures and logical conclusions) taught with problem-based learning models are better developed than students taught with conventional learning.

Problem solving studies in the field of teaching physics generally focus on problem solving behavior according to those who are "experts and beginners" [15]. Another area is the acquisition of problem solving skills in the classroom and laboratory environment. According to this classification, those who can use problem solving strategies efficiently and sustainably are described as Expert Problem Solvers, while those who cannot use these strategies adequately are defined as Beginner Problem Beginners [16]. Research has revealed that problem-solving experts first try to understand a problem by considering the laws and physical formulas and then try to solve them through mathematical methods. At the same time, as problem solving strategies, they usually follow the steps of understanding the problem, determining the concept, making a plan, solving the problem, and evaluating the results [17]. On the other hand, beginner problem solvers try to solve problems by first using mathematical expressions. It was stated that the success of students in solving physics problems did not only depend on students' knowledge of physics concepts but also on building relationships between all information and concepts in the problem

[18]. In this case, it has been observed that expert problem solvers need more time to understand the problems and concepts involved in the problem and to explore the relationship between information and this concept whereas novice problem solvers cannot establish these connections, especially in complex and difficult problems. In most of the research results presented are related to determining students' abilities on sub-steps of general problem solving strategies such as drawing diagrams, visualizing, using mathematical equations and understanding concepts [19] . These studies show that students' problem solving skills are related to the performance of problem solving sub-steps. It has been shown that students' physics problem solving abilities have affected the level of metacognition, achievement, attitude, motivation, self-efficacy and self-confidence [20]. Problem solving skills Visualization / problem description, Taking a physics approach, Using specific applications of physics concepts, Conducting mathematical procedures, Logical conclusions .. In the era of digital literacy where information is abundant, students must be able to choose the appropriate source and information. They need to justify the source of the aspects of objectivity and reliability. The teacher, in this context, plays an important role in helping students develop their communication skills [21]. The results show that students' problem solving skills need to be promoted in class. Implementing various learning strategies can be an alternative to developing problem solving skills of high and low ability students [22]. This research paper not only enriches the research literature but also has significance for problem solving in the theory and practice of physics education; provide a clear picture to understand educator problem solving strategies for the preparation of future research [23].

This research is a research development of problem based learning system / product model supporting the book model of teachers and class X students of senior high school that validity, practicality, and effectiveness. From the discussion of the results of the study it can be concluded as follows:

1. PBM-PL is developed through a learning model that is developed based on problems in learning physics. The difference in this model is in terms of the learning steps, namely in evaluating and analyzing problems and formulating hypotheses, namely into seven steps, while the old model is five steps. The model consists of 7 syntaxes, namely (1) Observation (observation), (2) Formulating a problem, (3) Analyzing Problems and Formulating Hypotheses, (4) Data collection, (5) Hypothesis Testing, (6) Developing and present, (7) Analyze and evaluate the problem solving process. The social model system requires multi-directional collaboration and interaction between the teacher and students, as well as the scaffolding provided by the teacher according to the students' needs. And the motivation given by the teacher to students in the learning process. The principle of learning model reactions can reward positive activities for students. Process oriented and students, and triggers students' problem solving skills. The impact of this model accompaniment shows the scientific attitude of students and has an attitude of rationality, honesty and independence. The model support system consists of teacher books, student books.
2. The problem based learning model in physics learning (PBM-PL) produced has a high level of validity and practicality. Obtained a learning model and its support system in the form of a teacher's book, a valid student book. The validity of the model in terms of several aspects namely the component content aspects and the principles and characteristics of the model development. As for the structure of the model in terms of organization, format, and language used. For the results of teacher and student book validation in terms of organizational aspects, format, aspects of the translation of material or content, use of language and illustrations or pictures. The practicality of the problem based learning model in physics learning (PBM-PL) along with the teacher's book and student's book. The prototype of the problem-based learning model along with the teacher's book and student's book is already practical according to observers, teachers and students. This shows that the model can be implemented well and the learning process does not occur significant problems or run in normal situations. For teachers with a teacher's book along with a model guide book can help the learning process. In general students like to follow the learning process by using student books with the application of problem based learning models. Overall it can be stated that the problem based learning model contains authentic assessment, teacher's books and books. students are easy to use, easy to understand, useful, and interesting.
3. Effectiveness of problem-based learning models on physics learning (PBM-PL) along with the teacher's book and student's book. The effectiveness observed in the implementation of this learning

activity, aspects of knowledge, and problem solving skills of students. Based on the results of data analysis and discussion obtained:

a. Activities and knowledge of students during the learning process develops well.
b. Towards the development of students' problem solving skills, it can be concluded that there are differences in the problem solving skills of students who are taught with problem based learning models and students who are taught with conventional learning. These differences indicate that critical thinking skills (visualization / problem description, physical approach, using special applications of physics concepts, carrying out mathematical procedures and logical conclusions) taught with problem-based learning models are better developed than students taught with conventional learning.

This research has produced a problem-based learning model in physics learning (PBL-PL) and its support system in the form of teacher books and student books which are proven valid, practical and effective in improving problem solving skills and student learning outcomes. The problem-based learning model in physics learning (PBM-PL) provides an opportunity for students to be actively involved in finding productive ways to adapt, modify and build basic knowledge and problem solving skills. Students describe specific problems, then try to solve them with the catalyst students can understand and conclude a problem or find other patterns to solve problems.
With this problem based learning model and its support system students are more active in developing abilities, attitudes and knowledge in accordance with their respective abilities, thus providing more meaningful learning for students. In general, this model can make learning Physics easier, effective and can be used as an indicator to improve mass solving skills and critical thinking of students and improve the development of activities, and student learning outcomes. Basically this research can also provide an overview and input, especially to teachers and education providers in general in improving the quality of learning. The assessment or validation of the PBM-PF learning model has several aspects which from these aspects include; theory supporting models, objectives, syntax, reaction principles, social systems, support systems, social impact, organization, model format and the language used. The evaluation / validation of model books and supporting products has several aspects that can have organization, book format, material aspects and language. Based on the model of the results of the assessment, the validation of the book model along with the teacher's book and student's books as a whole the components of the learning model based on the problem along with the teacher's book and student's book are very valid categories. Although there are improvements, they do not really affect it significantly. Based on the results of data validity analysis. The PBM-PF model obtained an average k 0.80 with a very valid category. The learning model is said to be valid if all the components of the model have been met. This is in accordance with the opinion of Arends, that the learning model should use an evaluation strategy that is consistent with the objectives and framework of the learning model as a whole [22].

Practicality of the problem-based learning model for physics learning was found and three things, namely, the implementation of the model in learning, the teacher's response as a practitioner in using the model, and the student's response. Learning models are stated to be practical if they are easy to use. Ease of use is seen from the implementation of the learning model. The results of the feasibility test show that the problem-based learning model for physics learning can be implemented with all criteria implemented. The model syntax can be implemented with a practicality average of 3.73. This means that every stage of the problem-based learning model for physics learning can be carried out. that the level of practicality is seen from the practitioner's opinion. The learning model is concluded as practical if (1) the practitioner states that the model can be applied in the field and (2) the level of feasibility of the learning model is categorized as "good". Based on this, it means that the problem-based learning model for physics teaching fulfills the practical aspect [23].

The effectiveness of student learning models and the competencies of students. The PBM-PF model was developed as a form of active learning so that one of the parameters for the effectiveness of the model was activists in learning, student activities observed were science process skills activities, group activities and scientific attitude activities. The results of the data analysis illustrated that the activities of the students in the three observed aspects were in the very active category. The effectiveness of the model is then seen from the improvement of students' knowledge competencies. The data analysis proves that the progress of learning outcomes in the aspects of student knowledge with the PBM-PF Model is better than the improvement of aspects of student knowledge with those who do not use problem-based models. This result is consistent with Jonassen, (1997), who said that problem-oriented learning involves various cognitive activities such as proportional information, concepts, principles and rules that are in the knowledge domain.

CONCLUSION AND SUGGESTION

The PBL-PL model facilitates students to carry out more complete social interactions, namely when students conduct experiments, discuss in groups and in class. This social interaction will encourage the growth of homogeneous and heterogeneous interactions both inter and between groups. This will change the pattern of learning in schools that have been more one-way to many directions by facilitating students to interact with each other. This PBL-PL learning pattern was developed in accordance with the expectations of the 2013 curriculum, which is student-oriented learning and based on scientific approaches. This can answer the challenges of the 21st Century, namely producing students who have competence in mastering core material, problem solving skills, learning and innovating skills as well as information technology and media skills. This learning model is socialized through Higher Education Tridarma activities. In education and learning activities are socialized to prospective teachers through lectures on learning strategy courses, learning planning, learning evaluation and microteaching. One of the suggestions given by the teacher is the need for training in using models so that they can be applied to other subjects.

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