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LEARNING PHYSICS USING RESEARCH-BASED MODELS WITH SCIENTIFIC APPROACHES TO IMPROVE STUDY PROBLEM SOLVING SKILL

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Abstract:

The development of learning tools is one of the abilities that must be possessed by teachers in each education unit in order to develop students' abilities in carrying out research-based learning. One tool that can support this goal is a learning tool based on research-based learning models with a scientificapproach. The purpose of this study is to develop high school physics learning tools using a lerning based research model with a scientific approach with valid, practical and effective criteria. The type of research used is research and development. The results of research on the analysis of students obtained that class students have been able to develop the ability to solve problems. In the validity test obtained an average percentage of RPP 85.79%, an average handout of 85.68%, an average LKS of 86.20%, and an average rating of 87.50%. Practicality test results obtained an average percentage of the implementation of the RPP is 89.16%, the average teacher response questionnaire 90.83%, and the average student questionnaire response 88.33%. Furthermore, the results of the effectiveness test were obtained from an attitude competency assessment with an average of 86.50%, an average assessment of knowledge competence 87.50%, an average competency assessment of 89.50%. The research shows thatthe High School Physics Learning Tool uses a research-based learning model using a Scientific approachto the material characteristics of waves which are in the category of very valid, very practical, and very effective so that it is feasible to be applied in the learning process.

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PENDAHULUAN

Not yet achieved the learning outcomes that are significant and as expected due to several problems, including the problem of the weakness of the learning process. Students are less encouraged to develop thinking skills in the learning process. The learning process in the classroom is directed to the child's ability to memorize information, students are directed to remember and hoard various information without being required to understand the information they remember to connect it with everyday life. As a result, when students graduate from school, they are theoretically smart, but they have poor application. In developing learning tools one learning model that allows students to develop thinking skills in solving problems and in accordance with the character of students and the material to be taught is the Research Based Learning model. This model is an attempt to assist students in constructing concepts or principles of physics using real examples, answering cases and contextual, together and finding something based on the philosophy of constructivism. In addition, physics learning with the Research Based Learning model also integrates research into learning, thus making learning more meaningful through the presentation of research results and encouraging students to think creatively, participate actively and independently in the future. Based on this description, it is necessary to conduct research into the development of learning devices with the Research Based Learning model with a scientific approach to the learning of high school physics characteristic of wave material. The Research Based Learning (RBL) model is one of the new learning models that provides students the opportunity to learn and build knowledge from research steps such as finding information, formulating hypotheses, collecting data, analyzing, making conclusions and compiling reports. Anauthentic-learning, problem-solving, cooperative learning, handson, and inquiry discovery approach, guided by a constructivist philosophy. Its usefulness has been recognized for many decades but "research inclassroom" has not been adopted as an atheaching method by many (Poonpan,2001). Based on the expert's explanation, the RBL can be concluded that RBL is a learning model that integrates research into the learning process in order to build knowledge by formulating hypotheses, collecting data, analyzing, making conclusions and compiling reports.

METODE PENELITIAN

A similar sentiment was also expressed by Patrick Guinness (2012) "advocates for research- based learning has pointed to the need to develop anenthusiasm for critical inquiry, resourcefulness and creative solutions in undergraduate tests". That the RBL can develop a critical attitude of mind, many ideas, and creative solutions. This type of research is a research development (Research Development) to create a product that is a learning device on the application of dynamic fluid in technology using the Reseacrh Based Learning model. According to Soenarto (2005: 70), development research is an effort to develop and produce a product in the form of material, media, tools, or learning strategies that are used to overcome learning problems in the classroom / laboratory and not test theories. Then confirmed by Nana (2006: 54), which states that research development is a process and steps to develop a new product or improve existing products. The development model used in this study is the ADDIE model. This model stands for analysis, design, development, implementation and evaluation. The concept of developing ADDIE models is applied to build learning based on implementation, learning must be student- centered, innovative, authentic and inspirational. ADDIE development model Is a process to determine the framework for complex situations, so that this model is appropriate for developing products in education (Branch, 2009: 2).

Stages of the Research Based Learning model (RBL) in learning according to Peter Tremp (2010) include the following: (1) Formulating general questions; (2) Overview of research-literature; (3) Defining the question; (4) Planning research activities, clarifying methods/ methodologies; (5) Under taking investigation, analyzing data; (6) Interpretation and consideration of results; (7) Report and presentation of results. Details on the RBL steps are presented in the table below.

Table 1. Details on the RBL steps

Number	Phase	Activity
1	Formulating a general-question	Provide a formula in the form of a topic or a problem in the form of a question
2	Overview of research literature	Examining reference material from various literatures
3	Defining the question	Define the question or formulate a hypothesis
4	Planing research activities, clarifying methods/ methodology	Explain research methods/ methodology

Number	Phase	Activity
5	Undertaking investigation, analyzing data	Conduct an investigation by taking data through observation and analysis
6	Interpretation and consideration of results	Analysis of the data obtained is interpreted and considered through group discussions
7	Report and presentation of results	Write in the report and present

Source: Peter Tremp (2010)

This development research is used to create a new product in learning, namely developing the Physical Learning Model of Reseacrhased Learning Learning on the wave Characteristics material for class XI Even Semester high school. The product developed is LKS.

HASIL PENELITIAN DAN PEMBAHASAN

Knowledge competency assessment results

Student learning outcomes data on the dimension of knowledge obtained from test results and written assessment of each meeting. The results of the first meeting are the results of the pretest regarding the characteristics of the waves, the second meeting is the answer score of the worksheet, while the third meeting is the result of the final test of the learning characteristics of the waves. In brief, it can be seen in Table 29. A complete analysis of the results of the knowledge competency assessment can be seen in the Appendix.

Tabel 2. Students' knowledge competency assessment result

Meeting to-	Average value	Predicate	Completed Students (people)	Students who are not completed (people)	Completeness (%)
I	82,60	B	22	8	73,3
II	84,00	B	24	6	80,0
III	88,40	B+	27	3	90,0
Average	85,00	B	24	6	81,1

From the data in Table 29, the average student learning outcomes in the knowledge dimension can be seen that of the 30 students at the first meeting, 8 students obtained grades below the KKM (<80), 6 students at the second meeting, and 3 people at the third meeting. The average score at the three meetings was 85%, while the percentage of mastery learning reached 81.1%. From Table 38 it can also be seen that students' knowledge competency has increased at each meeting.

From the results of the analysis of knowledge competency data for each meeting, it can be seen that the students' average score is only about 85%. This value is greater than the classical KKM set by the school, which is 80. So, if we refer to the KKM school the value of students' classical knowledge can be said to be complete. If you look at the completeness of students individually, then more than 70% of the number of students in the class have reached the KKM or completed. This is because students have been able to follow the wave characteristics learning well, the selection of Research Based Learning models is quite challenging for students because learning starts from the presentation of natural phenomena that are interesting and close to student life. The division of learning groups is arranged heterogeneously. The leader of each group is chosen from students who are ranked in class to organize and instruct their peers who have lower levels of learning ability. Time allocation for each learning activity is also sufficient and in accordance with the lesson plan.

In the third meeting, it appears that student learning outcomes have improved compared to previous meetings. The average completeness value reached 88.4% which is greater than the completeness classically that is 80.0%. Thus, it can be said that the development of learning devices on the material characteristics of waves based on the model of Research Based Learning with a Scientific approach can increase students' knowledge of the material characteristic of waves.

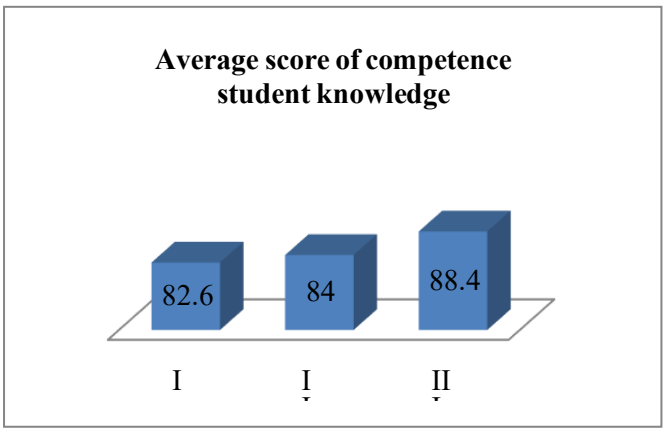

Figure 1. The average value of student competency

Based on Figure 1. it can be seen that the average value of students' knowledge competency increased from each meeting, seen the first meeting 82.6%, while the second meeting became 84% and in the third cycle increased to 88.4%. it is seen that using a Research Based Learning model with a scientific approach to the material wave characteristics can increase the effectiveness of students' knowledge competencies.

Result of attitude competency assessment

The attitude competency assessment in this study was conducted by observation. Student attitude assessment is done every time a meeting by the observer through the attitude assessment observation sheet. This assessment is carried out to see the extent to which the desires and good attitudes of students in responding to learning undertaken. The results of observations on student attitudes can be seen in the Appendix, briefly can be seen in Table 3.

Table 3. Recapitulation of student attitude competency assessment result

Observation Aspects	Value/ Meeting (%)			Average	Category
Spiritual Attitude	1	2	3		
Pray	77.5	95	91.7	88.1	Very good
Be grateful	80.0	88.3	93.3	87.5	Very good
Patient	80.0	81.7	90	83.9	Very good
Social Attitude	80.0	88.3	93.3	87.5	Very good
Critical	70	79.2	85	78.1	Good
Creative	82.5	83.3	92.5	86.1	Very good
Logical	75.8	80.8	90	82.2	Good
Analytical	70.8	74.2	83.3	76.1	Good
Curiosity	87.5	88.3	95	90.3	Very good

Table 3. shows that overall student attitudes are in the very good category with an average grade of 83.34%. From each meeting the attitude of students has increased. This shows that by using wave characteristics learning tools using the Research based learning model with a scientific approach, student attitudes can be better in the learning process. It can be said that the development of devices can improve student learning outcomes on the dimensions of attitude, even more so if the development of this learning device is deeper and its application is better.

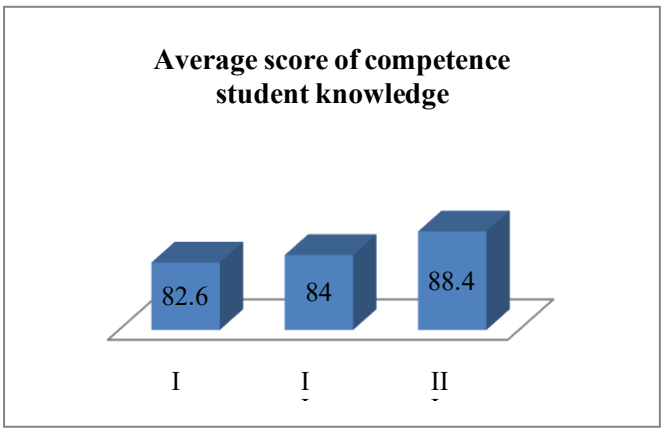

Figure 2. Student attitude competency assessment

Based on Figure 2, it can be seen that there are no students who are not serious in participating in learning, most students are always grateful for what they have obtained. They have been equipped with spiritual character education in schools through faith and piety programs which are carried out every day. Every time they begin and end their learning, they always pray with solemnity and order. Likewise, students' social attitudes tend to increase at each meeting. it is seen that the learning tools developed using a research-based learning model with a scientific approach to the material characteristics of the waves are categorized effective.

Skills competency assessment result

Data on the effectiveness of the use of learning tools were also obtained from observations of students' skills in learning based on modern research based on scientific learning approaches. The results of the analysis can be seen in Table 4.

Table 4. Result of student's skills competency assessment

Observation Aspects	Score	Predicate
Position the tool	79.2	B-
Arrange Tool	85.8	B+
Determine the waveform	82.5	B
Looking for relationship	89.2	B+
Make a graph	85	B+
Average	**84,34**	**B**

Based on Table 4, the average overall student skills are 84.34% and are in the predicate B. This means the learning device on the wave characteristics material using the Research Based Learning model with a Scientific approach can help students in carrying out experiments as part of scientific learning contained in the 2013 curriculum.

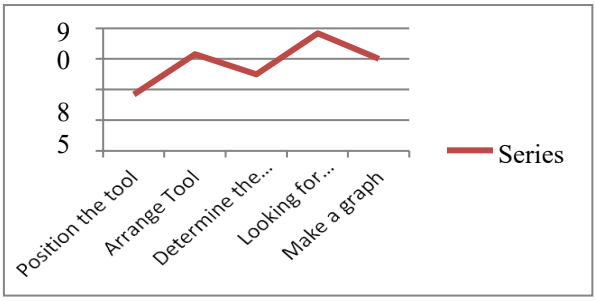

Figure 3. Student skill scores

Based on Figure 3 it can be seen that the average value of overall student skills is 84.34% and is in the predicate B means by using the Research Based Learning model using a scientific approach to the material wave characteristics can improve student skills competency so that the device developed can be said effective.

PENUTUP DAN KESIMPULAN

Based on the results of research and discussion, it can be concluded that the assessment in PBL of the research objectives that are widely reviewed is to know the relationship, 40%. Then the research design used is survey, 33.3%. For the population and sample, the students were 53.3%. Then the method of data collection is observation as much as 40% while the data analysis used is quantitative, 33.3%. assessment in PBL is very good when used on level student's high school and tertiary institutions, because high school students and students are good at carrying out solving activities through the formulation of coming to conclusions and being able to communicate in the learning process. Meanwhile for data collection techniques, namely surveys because by conducting surveys can see all student activities in the problem-based learning process.

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