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Development of Integrated Character Values on Physics Module Based on Problem Based Instruction (PBI) to Improve Problem Solving Ability

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Abstract :*The general purpose of this research is to develop integrated character values on physics module based on Problem Based Instruction (PBI) to improve student's problem-solving ability. While the specific purposes are: (1)to discuss about student's problem-solving ability. (2)To find the compatibility on PBI model. (3)To discuss about the importance of character values integrated on learning process. (4)To discuss about the importance of developing integrated character values on physics module based on PBI model.The development of this module refers to the Four-D model, which consist of four stages. They are Define, Design, Develop, and Dissemination stage. Meanwhile on this research was limited to Define stage to analyze the needs in developing this integrated module based on PBI model. The activities which were done on this stage are: (1) Field studies, (2) Literature review. The conclusions are: (1) the percentage of students' interest on learning physics are 48.89%, (2) students' difficulty on understanding the learning material are 57.78%, (3) using monotonous learning model are 48.33 %, (4) module's compatibility are 51.67%. Thus, the researcher offers to use the development of integrated character values on physics module based on Problem Based Instruction (PBI) to improve student's problem-solving ability.*

Keywords: *Character Value, Physics Module,Problem Based Instruction (PBI), ProblemSolving Ability*

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I. Introduction

The 21st century's phenomenon is globalization in almost all aspects of life. This phenomenon gives a big impact to all forms of job, included teacher. This became a professional challenge for all teachers in this era. The information that the teachers have will become archaic soon if it is not updated continuously. On the other hand, the teachers will no longer become the smartest person in the class, because their students can learn from other sources [1].

The 21st century's learning process should be adapted to the progress and demands of the times likewise the curriculum developed by schools. Nowadays, the curriculum which was developed by schools is required to be changed from the teacher-centered learning into the student-centered learning. It accords with the demands of children's future that should have both thinking and learning skills.

The included skills are problem solving, critical thinking, collaboration, and communication skills. All these skills can be possessed by students if the teachers are able to develop a lesson plan which contains some activities that challenge the students to have a critical thinking in solving problems. The activities which encourage the students to work together and show a good communication should be shown on each lesson plan.

Various efforts have been made by the government to improve the quality of the teachers included physic teachers. However, all government efforts have not shown a good result yet. The majority of students are still not interested enough in learning physic. It can be seen from Indonesian students' low and lack achievement in the mastery science in several international competitions.

On the learning process itself, learning should be more than just receiving, remembering, and memorizing the information. Teachers' duties are not only bringing a certain amount of information, but also to find a way to embed important concepts in student's mind. Teachers as people who are directly involved in learning process, actually can do many things, such as using an appropriate and fun learning model, generating students' enthusiasm, and encouraging the students to build their own knowledge. Those students' disinterests are impact of the lack of teachers' and students' preparedness, and the supporting mediums in their learning process. In addition, many teachers keep in using the Teacher centered and monotonous learning model and

teaching materials. Then the teachers are unable to solve the problems that the students have, as well as assessment that is still oriented to cognitive outcomes. All those things make physics become a big question for students. Thus, the students feel unfamiliar with the learning process, which indirectly cause their low motivation to solve the problem in physics.

Therefore, it is expected that through the supplying modules, students will be more easily to understand the concept of physics thus they will easy to apply it in their daily life. Besides, all the learning process should be able to provide the widest space for students in building character, relating knowledge, and improving their problem-solving ability. These problems could be overcome by applying the problem-based learning model (achievement concept). The PBI model helps students to develop thinking and problem-solving skills, and to encourage students to not only think concretely, but also think about abstract and complex ideas. In other words, this learning model trains the students to have high-level thinking skills.

II. Methods

The type of this research is development research with descriptive analysis method. It is compatible with the purpose of the research which is to analyze the needs that became basic in developing integrated character values on physics module based on Problem Based Instruction (PBI)model that refers to the Thiagarajan development model, known as the Four-D model (model4-D). The development of this model isconsisting of four stages, they are (1) Define, (2) Design, (3) Develop, and (4) Dissemination stage.

The produced physics module will be tested for its validity, practicality, and effectiveness, in order to make this learning material becomes effective and qualified. However, this research only performed the initial stage of 4D model, which is define stage. Here, the researcher was analyzing the needs for instructional material development based on the Problem Based Instruction (PBI) model integrated with character values. The undertaken activities on this stage are: (1) field studies; curriculum analysis, concept analysis, and learner analysis (2) Literature study. The samples of this research are teachers and learners of *SMKN 1 HiliranGumanti*Solok Regency, West Sumatra, Indonesia.

The aim of the curriculum analysis is to raise the basic problem on the development of physics teaching materials based on *concept attainment* learning model which integrated to faith values.The aims of the concept analysis are to determine the basic concepts to be taught; to determine the content and subject matter needed in the development of learning modules. The aim of the student analysis is to determine the learners' characters; included motivation to the subjects, academic ability, and students' opinion about their teachers in physics learning process in the classroom.

The aims of the literature study are (1) to review the physics subject in the curriculum of 2013 (2) to review the Problem Based Instruction model (3) to review the learning module (4) to assess the character values (5) to review the problem-solving abilities. The physics learning in the curriculum of 2013 should be designed as interesting as possible to make the facts, concepts, principles, and procedures can be mastered by learners more easily. One of the ways to improve students' learning motivation can be done by developing integrated character values on their module of based on Problem Based Instruction model to solve students' physics problems.

III. Results

III.1 Results of Trial Limited

Modules validated by experts, then improved on the advice of the validator, after the trial period. Testing was conducted at SMK 1 Hiliran Gumanti in class X TKJ A. Implementation of the pilot learning as much as 4 meetings held. Thetest result data module kinematics motion materialhas been developed.

III.1.1 Practicalities of Module

III.1.1.1 Questionnaire Response Educators

This questionnaire is filled by one-person educator SMK 1 HiliranGumantiSolokDistrict. In summary the results sheets of the practicalities of the response of educators can be seen in Table 1.

Table 1. Results of Analysis Questionnaire Response Against Practicalities Educators

No.	Meeting	Observation score	Average
1	I	89.58	92.71
2	II	91.67	
3	III	93.75	
4	IV	95.83	

Based on Table 1 looks votes at any meeting of educators to the kinematics motion modules on integrated material character values-based model of problem-based instruction to solve physics problems of

learners that have been developed have very practical class with an average of 92.71. Respondents considered that the modules developed to help facilitate educators in conveying the concept of kinematic motion in learning.

III.1.1.2Response Questionnaire Learners

Questionnaire responses of learners completed by 14 students. In summary the results sheets of the practicalities of the response of learners after learning to use the module can be seen in Table 2.

Table 2. Results of Questionnaire Response Analysis of Students Against practicalities Module

No.	Meeting	Score	Average
1	I	73.6	77.88
2	II	75.8	
3	III	78.2	
4	IV	83.9	

Based on Table 2 shows that the integrated module-based character values-based instruction problem models to solve practical problems of physics learners used by learners in the kinematic motion of matter.

III.1.2Effectiveness of Modules

III.1.2.1 Assessment of Knowledge

Data from learning competence of learner's knowledge briefly shown in Table 3. Minimum completeness criteria (KKM) agreed at the beginning of the meeting, in number 70. Based on Table 3 saw an increase in the competence of learners' knowledge. Not only the average increase at every meeting, but also an increase in classical completeness.

Table 3. Assessment of Knowledge of Students

No.	Meeting	Average value	Learners Completed (vote)	Learners Not Completed (vote)	Classical completeness (%)
1	I	72.9	12	2	85.7
2	II	74.3	13	1	92.9
3	III	79.3	14	0	100
4	IV	79.3	14	0	100
	Average	76.45	On average completeness		94.65

Average competency knowledge learners to four sessions is 76.65, while the percentage of completeness obtained has reached 94.65% that have exceeded their limits in the classical completeness. Based on these results it can be concluded that the integrated module of character values-based model of problem-based instruction to solve physics problems and declared effective learners. This condition can be described in the form of a bar chart in Figure 1.

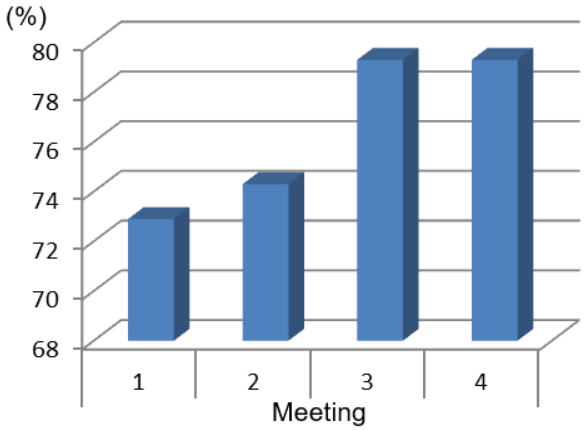

Figure 1. Average achievement of problem-solving abilityof students.

Based on Figure 1, an overall achievement of problem-solving abilityof students at each meeting. Likewise, with classical completeness, at the last meeting looks 100% of students declared complete.

Improved student learning outcomes can be identified through differences in average pre-test results and the average post-test results. Based on the pre-test results obtained an average pre-test class X TKJ A. After

learning materials integrated module integrated kinematic character values-based model of problem-based instruction to solve physics problems of students obtained an average result of post-test 83.57. Based on the comparison of the pre-test and post-test can be calculated increase in the study of students using normalized gain score.

$$\langle G \rangle = \frac{(\%\langle Sf \rangle - \%\langle Si \rangle)}{(100\% - \%\langle Si \rangle)} \quad (1)$$

Based on the analysis of learning use*gain score*, it can be stated that there is an average increase learning outcome. This was shown by an increase in gain score obtainedof 0.7 which is average. This proves that the integrated module of character values-based model of problem-based instruction to enhance problem solving physics students and declared effective.

III.2 Results of Deployment Phase

Deployment phase is done after the test phase of the first meeting has been completed, followed by a revised and implemented in different classes, at school as well as the same grade level and the response is different educators. Implementation is done in class X SMK 1 Hiliran Gumanti DPIB academic year 2017/2018. Piloted learning as much as 4 meetings held.

The following are the results of the implementation of the material module kinematics motion

III.2.1 Practicalities of Module

Practicality Data taken from the questionnaire responses of teachers and students after implementing learning the kinematic motion of matter.

III.2.1.1 Questionnaire Response Educators

In summary the results sheets of the practicalities of the response of educators can be seen in Table 4.

Table 4. Results of Analysis Questionnaire Response Against Practicalities Educators Module

No.	Meeting	Observation score	Average (%)
1	I	91.67	94.79
2	II	93.75	
3	III	95.83	
4	IV	97.92	

Based on Table 4 looks votes at any meeting of educators to the kinematics motion modules on an integrated material character values-based model of problem-based instruction to solve the physics problem learners have very practical class with an average of 94.79.

III.2.1.2 Response Questionnaire Learners

Questionnaire responses of learners completed by 21 students. In summary the results sheets of the practicalities of the response of learners after learning to use the module can be seen in Table 5.

Table 5. Results of Questionnaire Response Analysis of Students Against practicalities Module

No.	Meeting	Value	Average
1	I	77	80.20
2	II	78	
3	III	81	
4	IV	84.8	

Based on Table 5 shows that the integrated module-based character values-based instruction problem models to solve practical problems of physics learners used by learners in the kinematic motion of matter with practical level reached 80.20.

III.2.2Effectiveness of Using modules

III.2.2.1 Assessment of Knowledge

Data from learning competence of learner's knowledge briefly shown in Table 6.

Table 6. Assessment of Knowledge of Students

No.	Meeting	Average value	Learners Completed (vote)	Learners Not Completed (vote)	Classical completeness (%)
1	I	75.2	18	3	85.7
2	II	79	21	0	100
3	III	85.7	21	0	100
4	IV	91.2	21	0	100
	Average	82.8	Average completeness		100

Based on Table 6 saw an increase in the competence of learners' knowledge. Based on these results it can be concluded that the integrated module of character values-based model of problem-based instruction to solve physics problems and declared effective learners. This condition can be described in the form of a bar chart in Figure 2.

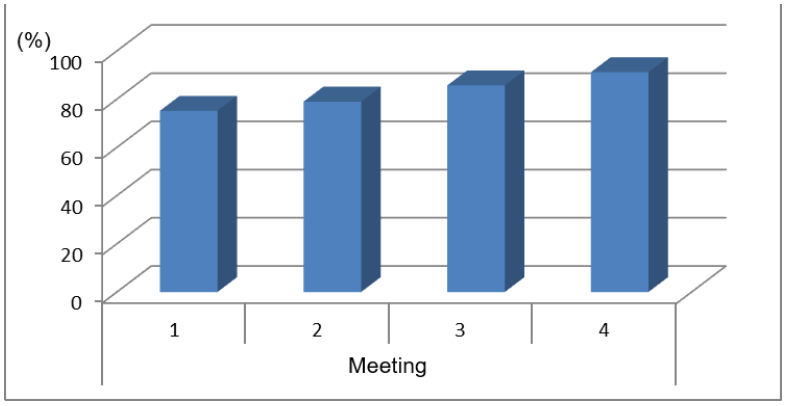

Figure 2. Average Achievement Knowledge Learning Outcomes of Students

Based on Figure 2, an overall achievement of learning outcomes of students at each meeting. Likewise, with classical completeness, at the last meeting looks 100% of students declared complete.

Based on the comparisonthe pre-test and post-test can be calculated increase in the study of students using the normalized gain score of 0.75 can be stated that there is an average increase learning outcome are categorized as moderate. This proves the integrated module of character values-based model of problem-based instruction to enhance problem solving physics students and declared effective.

IV. Discussion

Based on the results of the research that has been described earlier, it can be concluded that the ability of students' problem solving on physics can be categorized as low. And it has become a great asset to develop an integrated character values on module based on PBI to solve physics problems. The students' lack of interest in physics makes them lazy to review their lesson at home and learn their further material. The students choose to be passive in the learning process, and they agree if the lesson is dominated by the teacher. They said that it is more effective and efficient. It makes the students forgot the lessons easily and difficult to learn and response to physics problems.

Relate to the model of learning process in the classroom, it is concluded that teachers are more oriented to the formulas which are associated with the material. The teachers occasionally start the learning process with examples and relate it to the daily life. The students agree that the physics learning process needs a scientific approach (hypothesized). However, they less agree to test the hypothesis in learning process. The students prefer to get the conclusions directly from the teachers.

Relate to the need of integrated the characters values in learning process, it can be concluded that the teachers rarely link the material with facts in real life. In fact, it will improve the students' problem-solving ability. This is clearly shown from the statement of students who strongly agree that in the physics material should be integrated with the character values as well. Students also stated that the teachers have not integrated the material of physics with character values yet. And the students strongly agree to learn more about the phenomenon of physics based on character values which will increase their problem-solving ability.

Based on the previous description, it was concluded that the teachers' sources are still less varied. The teachers prefer to use teaching materials that are published by certain publishers, even though those materials use complex and difficult language to be understood. Thus, it generates students' boredom and makes them difficult to understand the concept.

Teaching materials that provided by schools are still not sufficient as a source of learning. The materials provided by the schools have not been integrated with character values which improve the physics problem solving ability. The materials used by the teachers have not been in accordance with the applied learning model, thus it needs some additional teaching materials for further concept understanding and able to improve the students' problem-solving ability. The current physics learning process is not able to improve the ability of problem solving yet.

Based on the result of the field study, it shows how important and urgent to develop physics module based on Problem Based Instruction (PBI) model that is integrated with character values. The initial step to develop this material effectively is to develop some appropriate learning tools. It needs to be done to increase students' problem-solving ability. In addition, it is also important to anticipate the development of time and prepare a competent generation to be able to compete internationally.

V. Conclusion

Based on the results of the field studies above can be concluded as follows: (1) 56.7% of students said Teacher Centered is more effective and efficient in the learning process. (2) 43.3% of students forget the past lessons. (3) 46.7% of students have difficulty in learning or responding to physics problems. (4) 56.7% of students stated that the teachers are more oriented to the formulas relate to the material. (5) 33.3% of students said that the teachers start the learning process with examples. (6) 50% of students strongly agree that physics materials should also be integrated with the character values. (7) 50% of students strongly agree that physics books that are provided by school still use a complex and elusive language. (8) 50% of students strongly agree that the teachers need additional teaching materials to strengthen the understanding of the concept and to improve the students' problem-solving ability.

Based on the results of those field studies and discussion, it is advisable to develop an integrated character values on physics module based on Problem Based Instruction (PBI) learning model. This development is not only on the teaching materials but also includes media and assessment. Hopefully, this module will improve the students' problem-solving ability on physics material.

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