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Research Article

The Development of Module Physics Learning Device Based on Inquiry Model by Concept Map Techniques in Improving Student Learning Outcomes

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Abstract.

The development used in this research is 4-D model that consisted of defining, designing, development and dissimilating stage. In defining stage there were some process to be conducted, they were designing on learning device that covers syllabus, RPP, module, and LKS. On development stage the test of validity were done through validity sheet of learning device, practicality testing through observation sheet on the using RPP, questionnaire response of the teachers and the students, affectivity testing were obtained from the assessment of knowledge, attitude, characters, skills and the questionnaire of students response. Then, the disseminating of teaching device were done in disseminate stage. The result of the implementation of lesson plans, teacher's response the questionnaires, student's response questionnaires, it was found that the modules that had been developed were very valid with percentages 88,34%. The results of the implementation of RPP, teacher's response questionnaires, student's response questionnaires found that modules that have been developed are in the very practical category. Moreover, the cognitive assessment results 87,50%, psychomotor assessment 82,86 %, and affective assessment 80,17%. Thus, this research produces a physics learning model based on the map concept technique which can improve learning outcomes.

Keywords: Physics learning; 4-D model; learning outcome; development

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1. Introduction

Learning is a process that is framed by the name of the system, then the necessary cooperation between components is to improve the quality of learning. In the learning process, especially physics learning, the point that should be considered is how students gain knowledge (learning to know), concepts and theories through practical experience

by carrying out observations or experiments (learning to do), directly (skill objectivity) so that they play a role as a scientist[1] [2] [3].

The module is a learning medium that is used for independent learning because in the module there are learning instructions that allow students to learn on their own without the help of a teacher or teacher. A module is said to be good if it meets several characteristics according to student needs. Furthermore, Inquiry learning model is a learning model that includes active, creative and innovative. Argues that inquiry learning is ”a series of learning activities that emphasize critical and analytical thinking processes to seek and find answers to a question in question”. The inquiry learning model tends to be student center. The word Inquiry comes from English ‘inquiry’ which can be interpreted as the process of asking and finding out answers to scientific questions it poses or the questions that can lead to investigation of the object. In other words, inquiry is a process of obtaining and obtaining information by making observations and / or experiments to find answers or solve problems to questions or problem formulations. The steps of inquiry learning have six stages, namely: problem orientation, formulating problems, formulating hypotheses, collecting data, testing hypotheses and formulating conclusions[4] [5] [6] [7].

The concept map is one part of the learning technique that consists of grouping ideas into smaller parts of a larger set of ideas. Concept maps were developed to dig into the cognitive structure of the lesson and know both for students and teachers. Besides that, the concept map is used to also express a meaningful relationship between concepts in the form of proportions.

2. Methods

The type of research conducted is developmental research, which produces products. The model used in this development is the 4-D Model (Four D Model), which consists of four stages, namely: define , design , develop and disseminate. The steps for the design of teaching materials development can be detailed as follows:

1. *The Defining Stage,* At the define stage, it includes three main steps, namely curriculum analysis, student analysis and material analysis. Curriculum analysis will be carried out on these four components. In student analysis, the analysis tool used is AUM PTSDL. AUM PTSDL is used to reveal the problems faced by students. In material analysis aims to identify, detail and systematically arrange the main materials of static fluid material which will be used as the contents of the syllabus, lesson plans and modules to be developed.

2. *Design Stage,* The second stage is the design. At this stage, the design of physics teaching materials is carried out on static fluid material based on a concept map - inquiry learning model consisting of a syllabus, lesson plans and teaching materials. At this design stage, two stages were carried out, namely the design of the preparation of the instruments needed in this study and the prototype of the teaching materials.

3. *Development Stage,* The next stage is Develop, at this stage the validity, practicality and effectiveness test will be carried out. To test the validity of the teaching materials will be judged by five people validator which is composed of three persons, they are, the lecturer of State University Padang, two practitioners /teachers of SMAN 6 Padangsidimpuan. The practicality test is carried out by asking for teacher responses and student responses after using modules in the learning process. The practicality of the module is also determined from the observations of the implementation of the lesson plan during the learning process. Observations were made by 2 observers, namely the physics teacher at SMAN 6 Padangsidimpuan. The test of the effectiveness of teaching materials was seen from the increase in knowledge competencies.

4. *Disseminate Stage,* The dissemination stage (disseminate) is carried out in different classes. Subject trials is a module based on inquiry learning model assisted technique concept map that was developed and used as a reference book in the school library.

3. Results and Discussion

3.1. Results of Phase definition (define)

The definition stage aims to define the requirements of learning by analyzing the learning objectives of the material developed into the learning module. The definition stage is the basis of module

development on static fluid material. The component analysis is as follows:

3.1.1. Curriculum Analysis Results

Curriculum analysis activities are carried out using control sheets made in the form of entries. Students have personal masters of procedural knowledge in learning physics

and keep up with technological developments, have behaviors that reflect the attitude of believers, have noble character, are confident and responsible in interacting effectively with the social environment, the natural surroundings, as well as the world and civilization.and the ability to think and act effectively and creatively in the realm of abstract and concrete related to the physics material they are learning. From the learning objectives, the scientific approach is very suitable to be carried out on static fluid material. Students are invited to be active in observing, asking questions, gathering information, associating and communicating for all subjects from static fluid material. The appropriate learning model for educators to convey static fluid material is Inquiry - based learning model by concept map techniques .

3.1.2. Student Analysis Results

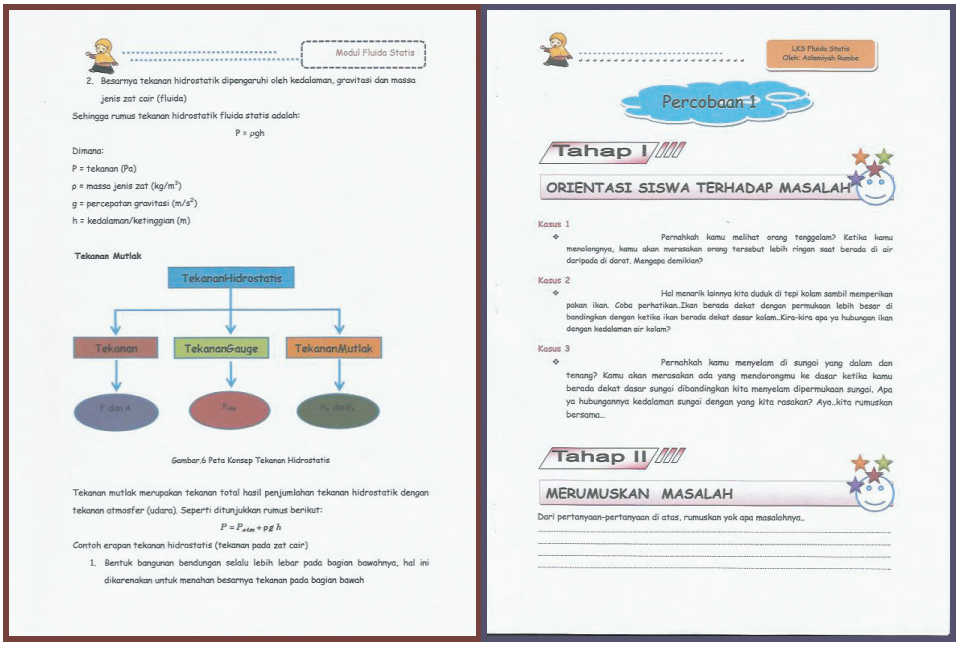
PTSDL AUM is used to reveal the problems faced by students. The results of the students' analysis of the learning material in general, the level of mastery of the initial material as a prerequisite for the next material was still not optimal. As many as 63, 75 % of students experienced problems in mastering the material prerequisites, because they did not repeat the learning material that had been taught . For learning skills 81, 25 % of unskilled students use textbooks because the language is complex and difficult to understand. Students who have difficulty solving problems given by the teacher are 56, 25 % of students.

3.1.3. Result of Material Analysis

In the material analysis, a control sheet is used in the form of entries. Broadly speaking, the materials in static fluids consist of three parts, namely: (1) Hydrostatic Pressure and Pascal's Law, (2) Archimedes' Law, (3) Surface Tension and Capillarity.

3.2. Design Stage Results (design)

Modules that have been develop the modul an inquiry-based learning model by concept map techniques, can seen in the figure1.



(a) (b)

Figure 1: Develop The Modul an Inquiry-Based Learning Model by Concept Map Techniques.

3.3. Results of the Development Stage (Development)

The purpose of this stage is to produce a module of static fluid material in an inquiry-based learning model by a valid, practical and effective concept map technique so that it is suitable for use in the learning process. The Results of the assessment of the sheet validator validation, which consists of three lecturers from the State University of Padang and two practitioners / physics teacher at SMAN 6 Padangsidimpuan. The result of validation module can be seen in Table 1.

Table 1. Results of the Learning Device Validation Sheet Assessment

TABLE 1

No.	Validator name	Score
1.	AZ	100
2.	EZ	75.00
3.	YH	91.70
4.	ER	75.00
5.	FB	100
	Average	88.34 (very valid)

Practicality data were obtained from the results of observations on the implementation of lesson plans, teacher response questionnaires by two high school physics

teacher practitioners and questionnaire responses from class X SMA Negeri 6 Padangsidepuan to the module. The results of the practicality of the module can be seen in Table 2.

Table 2. Results of Practicality Instrument Assessment

Table 2

Instrument	Rating (%)					Average (%)
	Validator					
RPP implementation	100	75.00	91.70	75.00	95.80	87.49
Practicality Module (Teacher's Response Questionnaire)	100	75	96.4	75	100	89.28
Practicality Module (Student's Response Questionnaire)	100	75.00	95.70	75.00	97.5	88.64
Average	88.87 (**very practical**)					

The effectiveness module data is obtained based on the results of student learning which includes competency knowledge and questionnaire responses of students. The results of module effectiveness can be seen in Table 3.

Table 3. Result of Learning Module Effectiveness

Table 3

No.	Effectiveness Data	Score	Predicate
1.	Knowledge Competence	79.20	B
2.	Attitude Competence	80.17	B
3.	Skill Competence	82.86	B
4.	Student's response questionnaire	82.60	B
	Average	**81.27**(very effective)	

3.4. Results of the Spread Stage (Disseminate)

At this stage the distribution is carried out on a small scale, namely to different classes and teachers, learning outcomes in Table 4, as well as being a reference book in the school library.

Table 4. Student Competency Values in the Spread Class

3.5. Discussion

Table 4

No.	The Effective Data	Score	Predicate
	Knowledge Competence	84.1 0	B
	Attitude Competence	80.0 0	B
	Skill Competence	78.5 0	B
Average		80.2 0	B

3.5.1. Define stage

Phase defining an early stage in the development of teaching materials aimed at defining the terms of the learning by analyzing the learning objectives of the material development. At this defining stage, curriculum analysis, student analysis and material analysis are carried out. In the curriculum analysis, on the KI and KD analysis, the appropriate material is static fluid material. On the other hand, in accordance with the circumstances and characteristics of the school and students, it is hoped that the application of this learning module can have a positive effect on the students themselves.

3.5.2. Design Stage

The design phase of the module of learning is done with the design toward contents of the module, then proceed with the construction design, and ends with the correct use appropriate Indonesian enhanced spelling (EYD). Furthermore, the design module is also adapted to steps models based learning model inquiry-assisted engineering concept map on a static fluid material.

3.5.3. Developmental Stage

At the developmental stage, it begins with the validation of the Physics learning module based on the inquiry learning model by the concept map technique on static fluid material. The validity includes: content validity and construct validity, content validity declared valid by the validator. Based on the results of module validation based on the inquiry learning model by concept map technique on static fluid material, the percentage of validation value is 88 , 34 % is categorized as very valid . This shows that the modules developed are in accordance with the expected curriculum demands.

Module practicality relates to the ease of use of the modules used by teachers and students. The practicality of the module can be measured from the results of the RPP

implementation questionnaire. It can be seen that the average percentage is 87.49 % which is in the very practical category. From the results of the teacher response questionnaire it can be seen that the average percentage of teacher responses to the lesson plans and modules used is 89 , 28 % which is in the very practical category.

The results of the student response questionnaire also showed that the practicality of the module was in the very practical category with the percentage of practicality being 88 , 64 % . In general, from the results of this data analysis it can be concluded that using a learning module based on the inquiry learning model is very practical. The value of module effectiveness is related to the value of the instrument of knowledge, attitudes, skills and the questionnaire of students' responses to the module. The results of the knowledge analysis were 79.20%, attitude scores were 80.17%, skills scores were 82.86% and the student response questionnaire was 82.60 with an average of 81.27%, which stated that the learning module was based on the inquiry learning model by the concept map technique on effective static fluid material.

Based on the description above, the learning module based on the inquiry learning model by the concept map technique on static fluid material meets the desired standards, which is very valid, very practical, and effective and improves student learning outcomes.

3.5.4. Stage Disseminate

At this stage the distribution is carried out on a limited scale, namely to other classes and other teachers, to see the effectiveness of the learning module based on the inquiry learning model by the concept map technique on the static fluid material used. The effectiveness of using learning modules is seen based on knowledge competency of 84.10%, attitude of 80.00% and skills of 78.50% , it is stated that the learning module based on inquiry learning model by concept map techniques on static fluid material is very effective and improves student learning outcomes.

4. Conclusions

In the implementation of a good learning process, a tool or material is needed to help the implementation of learning properly which is called a learning module. Physics learning module based on inquiry learning model by concept map technique on static fluid material is a module that can be used as a reference or an example for physics teachers in designing modules on other physics material.

References

[1] Aunurrahman. Belajar dan pembelajaran. Bandung: ALFABETA; 2014.

[2] Slameto. Belajar dan faktor-faktor yang mempengaruhinya. Jakarta: Rineka Cipta; 2010.

[3] Dimyati, Mudjiono. Belajar dan pembelajaran. Jakarta: Rineka Cipta; 2013.

[4] Trianto. Mendesain model pembelajaran inovatif-progresif. Jakarta: Kencana; 2010.

[5] Sanjaya W. Strategi pembelajaran berorientasi standar proses pendidikan. Jakarta: Kencana Preanada Media; 2016.

[6] Riduan. Belajar mudah penelitian untuk guru, karyawan, dan peneliti pemula. Bandung: Alfabeta; 2009.

[7] Trianto. Mendesain model pembelajaran inovatif-progresif. Jakarta: Kencana; 2010.