Development of Teaching Modules Based on Problem Solving

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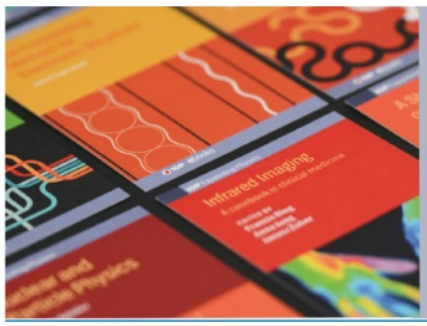

Development of Teaching Modules Based on Problem Solving

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Abstract. This research aims to develop teaching module products based on problem solving and disseminate product results to students as users. This research is a development research that uses three stages, namely: (1) preliminary research, (2) the stage of making a prototype, and (3) the assessment stage. Based on the data analysis of the validation results from the validator and the readability test analysis by the students' assessment of the feasibility of teaching modules based on overall problem solving, the total mean score was 3.39 with the criteria feasible. The assessment of problem solving based teaching modules consists of two aspects, namely aspects of assessing the feasibility of content and aspects of evaluating the feasibility of presentation. Aspects of the feasibility assessment of the contents of problem solving based teaching modules obtain an average value of 3.22 with eligible criteria. The aspect of the feasibility assessment of presentation obtained an average value obtained from 3.55 with the criteria feasible. While the results of the teaching module based learning on problem solving to students viewed from the results of the student satisfaction questionnaire on the use of teaching modules developed were 83% of students very good, while the remaining 17% were good.

1. Introduction

The learning process in the classroom is the most basic activity in the whole process of education. Learning activities will be good if there is reciprocity (interaction) between lecturers and students. There are three kinds of interactions in the learning: student-teacher, students, and student-subject matter [1]. The courses taken by students include theoretical courses and practical subjects that require teaching materials that can help so that learning objectives can be achieved. In this study the teaching material developed is a teaching module based on problem solving, especially the development of Basic Physics practicum modules for mechanical engineering students. The thing that underlies this research is that the Physics practicum is one of the courses taken by mechanical engineering students. Basic skills needed by students in conducting practicum, among others: planning practical activities, carrying out practicums, analyzing the results of the lab and reporting the results of the lab. Besides this this course is an implementation of the theory course so that learning is more fun. While the meaningfulness of learning physics knowledge will be realized if it is done by several methods of scientific methods and accompanied by cognitive reasoning for the data obtained and observed natural symptoms [2]. The problem that many students experience is assuming that theoretical physics courses are difficult subjects because there are too many memorized formulas, understanding the concepts of physics that are still lacking. Then a tool is needed to facilitate students' understanding of theoretical physics courses. The tool is a practical activity that can implement theories taught in theoretical physics courses.

Physical practicum activities required a practicum module that can be used to help the learning process. The learning module is the smallest unit of learning program, which is taught by students themselves individually or taught by students to themselves (self-instructional) [3]. Whereas according to [4], "modules are teaching materials that are packaged intact and systematically, in which contain a set of planned learning experiences and are designed to help students master specific learning goals. From the explanations of the researchers above, a conclusion can be drawn that modules are one of the teaching materials learned by students that are packaged in a complete and systematic manner. With this it is expected that the assistance of the practicum module will help students to understand a Physics concept through practical activities. And make learning more meaningful. Learning means going to be a teacher experiencing what is learned, "the constructivist perspective describes learning as a change in meaning constructed from experience" [5].

The challenges of students in the practicum process arise from problems presented in the practicum module used. The problems raised in the practicum module are understandable problems but there are challenges to answer them and answers to questions must be procedural. The way to solve problems in problem solving cannot be directly understood. Students need to have the ability to solve problems effectively. The problems presented in learning are non-routine and challenging problems where the problem is complex and there is no way or strategy that is ready to be directly used to solve it, so it takes a creativity to solve it [6], [7]. Problems can be called problems or problems, at least have 2 things, namely: (1) Challenging the mind (challenging), (2) Not automatically known how to solve it (non-routine)

2. Methods

The object of this research is students of mechanical engineering study programs who take basic physics practicum courses. The research conducted is development research. The development model used in developing this basic Physics practicum module is a development model [9]. There are three stages in this model, namely preliminary research, the stage of making a prototype, and the assessment phase. The type of data in this development research consists of quantitative data and qualitative data. Quantitative data is in the form of an average questionnaire. Questionnaire data in the form of a checklist with a scale of 1-4. Scale 1: disagree, incorrect, unclear; scale 2: disagree, inaccurate, unclear; scale 3: agree, right, clear; scale 4: very agree, very right, very clear.

While the qualitative data is in the form of suggestions, criticisms, and responses from the validator. Suggestions, criticisms, and responses from the validator are used as considerations in making revisions to the basic physics practicum module based on problem solving. The validation subject (validator) is 3 lecturers. Validators are lecturers who have expertise and experience in writing teaching materials. Product testing was also conducted on mechanical engineering study program students who had taken basic physics practicum courses, this was done to determine the level of readability of the module developed.

The instrument of data collection used in this development research is a questionnaire. The questionnaire used consists of two parts, namely: assessment questionnaire and questionnaire sheet suggestions and comments from the validator. The aspects contained in the practicum module assessment questionnaire are: (1) the feasibility of the content which includes: the suitability of the material description with the RPS, the accuracy of the material, and learning support material; (2) the feasibility of presentation which includes: presentation techniques, learning presentation, and presentation. The questionnaire was submitted to the validator to provide an assessment of the problem solving based Physics practicum module. The results of the assessment are then analyzed using the data analysis techniques specified.

The data analysis technique used to analyze the results of the due diligence data is the average calculation. Determination of the average value analysis technique based on the opinions of [10], which states that to find out the final grade rating on the research questionnaire, the number of values obtained is divided by the number of respondents who answered the assessment questionnaire.

Presentation of data from the development of Basic Physics Based Problem Solving Modules as Supporting Basic Physics Practicum Courses consists of: (1) description of module development, (2) data from validation module development (3) data on student readability of modules. The

development description contains a brief description of the contents of the module being developed. The data from the module development validation contains responses, suggestions, criticisms, and validation data from 3 lecturers. Whereas, data from the readability of students contains difficult words and sentences that are not understood by students.

3. Results

3.1 Results of Module Development Validation

The data from the validation of the development of the Problem Solving Basic Physics module were obtained from 3 validators, namely 3 lecturers who were competent in the research field. The data obtained is quantitative and qualitative data. Quantitative data in the form of an assessment questionnaire with a Likert scale, while qualitative data in the form of responses, suggestions, and criticism from the validator. Data from the validation results were analyzed by the analysis of the average value in each aspect. The data from the validation results in each aspect can be seen in Table 1, Table 2 and Table 3, while the responses, the criterion of the validator is presented in Table 4 as follows.

Table 1. Assesment of The Content of Feasibility Aspect in The Module

No	Aspect assesed	Validator			Average	Remarks
		V_1	V_2	V_3		
1	Material Conformity SK and KD	3.67	3.00	3.00	3.22	eligible
2	Accuracy of Material	4.00	3.33	3.00	3.44	eligible
3	Total Average Value	3.00	3.33	2.67	3.22	eligible
Total Average Value		3.56	3.22	2.89	3.22	eligible

Table 2. Evaluation of Feasibility Aspects Of Module Prsentation

No	Aspects assesed	Validator			Average	Remark
		V_1	V_2	V_3		
1	Presentation Technique	3.67	3.33	3.33	3.44	Eligble
2	Learning Presentation	3.60	3.80	3.60	3.67	Eligible
3	Completeness Presentation	3.33	3.17	3.17	3.22	Eligible
Total Average value		3.87	3.43	3.37	3.55	Eligible

Table 3. Assessment of the Feasibility Aspects of the module

No	Aspect assesed	Validator			Average	Remarks
		V_1	V_2	V_3		
1	Content Feasibility	3.56	3.22	2.89	3.22	Eligible
2	Feasebility of Prsentation	3.87	3.43	3.37	3.55	Eligible
Total Average Value		3.71	3.32	3.13	3.39	Eligible

Table 4. Validators' Responses, Suggestions and Critics

No	**Aspects**	**Response, Suggestions, Critics**
	Content Feasability	
1	Conformity of the Student Characteristics with SK and KD	• Material for each module is compatible with what is in RPS
2	Accuracy of the Material	• The teleprint of the module "measuring the level and uncertainty" is very long, however, it is short and clear.
		• In the tools and materials of the "hot type of solid material" number 8: release and stretch of heat to be modified to burn Bunsen spirits and props.

		• It is good, with simple variations in images and in daily life events
3	Learning Support Materials	• Enough to present and hope to be simplified.
		• It is good, to talk about the problems in daily life
Feasibility of Presentation		
4	Presentation Techniques	• Already good, simplistic concepts are presented before more complicated concepts
5	Presentation of Learning	• Use of lights / burners for many women who have been treated with mathematics and medical risk is quite high.
		• For the use of the term that the English are expected to be translated.
6	Completeness of Presentation	• Already adequate
		• Current list of references.

3.2 Data Analysis of Module Feasibility Assessment

Data analysis on the development of problem solving based Basic Physics modules is based on the results of the analysis of the average validation of the Likert scale questionnaire which consists of 3 validators. Based on the data the overall validation results obtained by the average value is 3.39. From the data from the validation results, it can be concluded that the development of problem solving based Basic Physics modules does not require significant content competition. The explanation of the validation data is as follows.

A. Feasibility of Content

Assessment of the feasibility aspects of the contents of the problem-based Basic Physics module has 3 assessment criteria, namely: the suitability of the material description with SK and KD, the accuracy of the material, and learning support material. While the validation of the 3 validators on the three criteria in the aspect of content feasibility shows that the average value of the material aspects of the description of the material with SK and KD is 3.22, the average value of the material accuracy aspects is 3.44, while the supporting material aspects the learning value are average. obtained from 3 validators of 3.22. So that the average score on the aspect of the feasibility assessment of the contents of the Basic Physics module based on problem solving is 3.22 with the criteria feasible.

B. Feasibility of Presentation

The assessment of the feasibility aspects of the presentation of the Basic Physics module based on problem solving has 3 assessment criteria, namely: Presentation Technique, Learning Presentation, Complete Presentation. While the validation results from 3 validators on the three criteria in the feasibility aspect of the presentation show that the average value of presentation technique aspects is 3.44 , the average value in the aspect of learning presentation is 3.67, while in the completeness aspect the presentation of the average value obtained from 3 validators is 3.22. So that the total average value in the aspect of feasibility assessment is based on problem solving based on 3.55 with eligible criteria.

C. Module socialization

Socialization activities towards teaching modules based on this problem solving process are done to students who have taken basic practice in Physics. The purpose of this socialization is to measure the understanding of the foundation of the modules and the extent to which the teaching modules developed can help students to receive good material on the basic curriculum practice Physics The basics are taken. Assessments in this stage are in the form of satisfaction of the use of teaching modules given to students.

4. Conclusions

Product development results are in the form of problem solving Basic Physics modules. Problem solving based Basic Physics Module results of the development have gone through the revision stage in accordance with the test results strived by 3 validators and the results of student satisfaction questionnaires that have taken the basic Physics practicum.

1. Aspects of assessment of feasibility of modality Physics Based on problem-solving based on the average value of 3.22 with a questionnaire.
2. Evaluation aspects of the feasibility of the presentation of the average value obtained from the validator is 3.55 with a questionnaire.
3. The assessment of the feasibility of Physical modules on the basis of overall problem solving is obtained by the total mean value of 3.39 with a questionnaire score.
4. The results of the student satisfaction series using teaching modules developed were 83% of the students were very good, while 17% were good.

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