American Journal of Engineering Research (AJER)
e-ISSN: 2320-0847 p-ISSN : 2320-0936
Volume-8, Issue-11, pp-57-61
www.ajer.org
Research Paper Open Access

Developing $\mathbb{R}^3$ Analityc Geometry Module By Using Problem-Based Learning Strategy for Education Mathematic' s Students

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ABSTRACT : *This research aims to developt a Problem Based Learning-Oriented Module for $\mathbb{R}^3$ Analityc Geometry which valid for Mathematic Education's Student's. The module was developed by applying four-door (4-D) Model, which consist of for steps, that is (1) Define, (2) Design, (3) Develop, (4) Disseminate. The module eligibility was tested by material expert and media expert. The result of validity test showed that the feasibility of module was very valid with percentage 84,66 %. Based on the research result can be conclude that Problem Based Learning-Oriented Module for $\mathbb{R}^3$ Analityc Geometrywas valid to be used as learning media for mathematic education's student's.*
KEYWORDS : *Module, $\mathbb{R}^3$ Analityc Geometry, Problem Based Learning*

Date of Submission: 27-10-2019 Date of acceptance: 15-11-2019

I. INTRODUCTION

One of the main course in Education Matematics Study Programme at Bung Hatta University is $\mathbb{R}^3$ Analityc Geometry. The lecturer had been applied student's center learning strategy in the learning process, but the expected student's learning outcomes are still not satisfactory. It can be seen from the final value of$\mathbb{R}^3$ analytic geometry where of the 38 students who took this course only 62.4% of the students who obtained a value of ≥70. This condition shows that the percentage of students with good learning outcomes is still not optimal.

In order to make easy for students to understand the course, the writer was motivated to create a learning media in the form of modules. The learning modules that are created will be packaged and adjusted to the principles of learning that are oriented to problem based learning. Problem-based learning is a learning model that focuses on problems that are used as a starting point from the concept development of learning in students [3]. Problem based learning is learning whose delivery is done by presenting a problem, asking questions, facilitating inquiry, and opening dialogue [9].

According to [7]modules can be formulated as a complete and independent unit and consist of a series of learning activities arranged to help students achieve a number of objectives that are specifically and clearly formulated. Module is a learning package which contains a single concept unit of learning material for students to learn on their own and if he has mastered it can only move to the next learning package unit [14].The module is useful to assist students in learning a teaching material. The module has several characteristics, [1] revealing that the characteristics of teaching materials are (1). Self Instructional, i.e. teaching material can make students able to learn themselves with developed teaching material, (2). Self Contained, all subject matter from one competency or subcompetency unit studied is contained in one teaching material as a whole, (3). Stand Alone, developed teaching materials do not depend on other teaching materials or do not have to be used together with other teaching materials, (4). Adaptive, namely teaching material should have a high adaptive power to the development of science and technology, (5). User Friendly is that every instruction and information exposure that appears is helpful and friendly to the wearer, including the ease of the user in responding and accessing as he wishes.(6). Consistency, consistent in the use of fonts, spaces and layout.

Many researcher have worked in this area by developed problem based learning module. First, [4] have developed a valid and practice statistic module for students of Faculty Teacher Training and Education of Bung Hatta University. Next, [10] have developed a very valid Problem Based Learning Module on Mathematical Logic course. Beside that [11] haved developed e-module on problem based learning on heat and

temperature to improve students skill.Next, [6] have developed mathematic module based on Problem Based Learning to improve student's problem solving skill.Then[2] have developed a valid module for transformation geometry course.
The steps of problem based learning strategy as follows [8] :

Tabel 1. The steps of Problem Based Learning Strategy

No	Steps	Lecturer Activity
1	Student orientation to problems	The teacher explains the learning objectives, explains the logistics needed, submits the problem, motivates students to engage in the problem solving activities they choose.
2	Organizing students for learning	The teacher helps students define and organize learning tasks related to the problem
3	Guiding individual and group investigations	The teacher encourages students to gather appropriate information, carry out experiments, to get an explanation of problem solving
4	Developing and presenting the work	The teachers helps students in planning and preparing appropriate work such as reports, videos, models and helps them to share assignments with their groups.
5	Analyzing and evaluating the problem solving process	The teacher helps students carry out reflections or evaluations of their investigations and the processes they use.

II. RESEARCH AND METHOD

The validity test analyzed by using statistic descriptive. The instrument of this research was validity questionnaire. The validityquestionnaireconsist of content, languge, lay out, and grafis aspects. The validity of module analyzed in 4 steps, that are :

1. Giving scores for validator's questionnairebased on Likert Scale from 1-4 with criteria as follows :

Table 2. Criteria of Likert Scale

No	Criteria	Score
1	Very Agree	4
2	Agree	3
3	Disagree	2
4	Very Disagree	1

2. Counting highest score from validator's questionnaire as follows :

$$\text{Highest score} = \text{sum of validators} \times \text{sum of indicators} \times \text{sum of maximum score}$$

3. Counting scores from each validators (V_i)
4. Counting the validity of modul as follows :

$$\text{validity} = \frac{V_i}{\sum Vi} \times 100\ \%$$

5. Giving validation criteria as follows :

Table 3. Criteria of Validation

Nuumber	Interval	Criteria
1	81% ≤ Nilai ≤ 100%	Very Valid
2	61% ≤ Nilai < 80%	Valid
3	41% ≤ Nilai < 60%	Is Quite Valid
4	21% ≤ Nilai < 40%	Less Valid
5	0 ≤ Nilai < 20%	Invalid

III. RESULT AND DISCUSSION

From design stage, determination of the format was done by arranging the aspects contained in the module, illustrated images, colors, shapes, and font sizes used, as well as the contents. The format displayed on the module refers to the specified product specifications.The illustrated image contained in the module is sourced from a download at http:// www.google.com. In addition, researchers also use applications in the form of mathematical software, Geogebra, to create images of geometrical shapes. The dominant color applied to the

module is light blue. Every image design was created with the help of the Coreldraw application. The font used is a type of antiqua book with a size of 12pt. The cover display of the module as follows as:

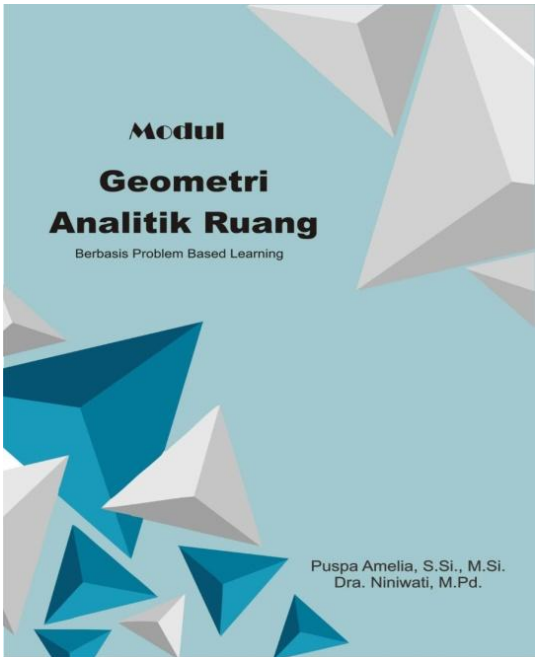

Figure 1. Cover Design of Module

The preparation of the module content is based on the results of curriculum analysis and material concepts that are in accordance with the Semster Learning Plan. The material in the module consists of 3 main chapters, namely the coordinate system of space, equations of flat fields, and spherical equations. Each chapter consists of 2 to 3 learning activities. The learning in this module is designed with a problem based learning approach. It aims to enable students to understand the material contextually so that independent, active and critical learning can be created. Here is given an example of the contents of the module:

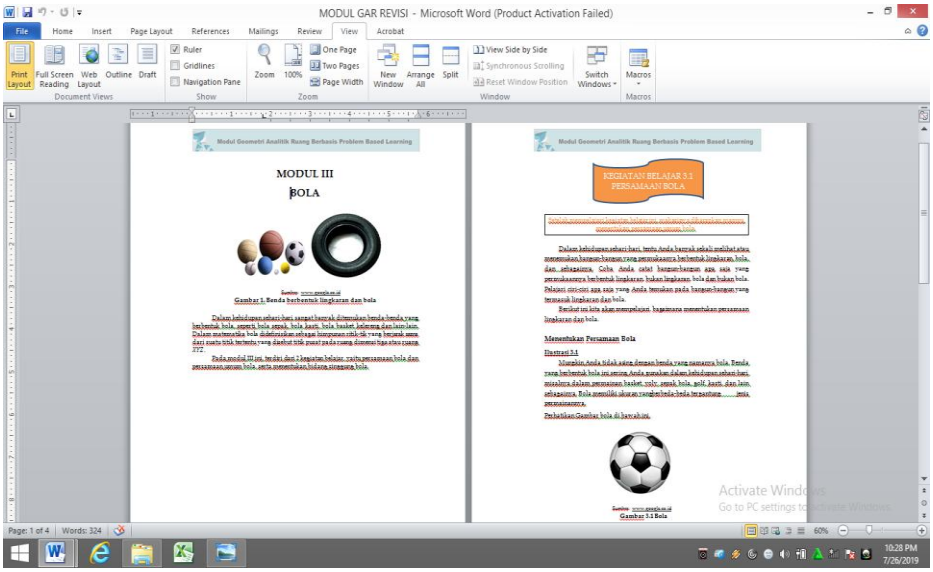

Figure 2. Example For Content of Module

The Produt was validated and revised based on material academic expert (lecturer teaching geometry) and media expert. From questionnaire of validator obtained the result of recapitulation as follows :

Tabel 4. Recapitulation of Validator's Validity Value

Number	Component	Item Number	Validator's Value		Scores	Validity Value	Criteria
			1	2			
A	Didactis	1	3	3	6	85%	Very Valid
		2	3	3	6		
		3	3	4	7		
		4	3	4	7		
		5	4	4	8		
Sum of Scores			16	18	34		
B	Construction	1	4	3	7	88.75 %	Very Valid
		2	4	4	8		
		3	4	4	8		
		4	3	3	6		
		5	4	4	8		
		6	4	3	7		
		7	4	3	7		
		8	4	3	7		
		9	4	3	7		
		10	3	3	6		
Sum of Scores			38	33	71		
C	Technique	1	3	3	6	78.57 %	Valid
		2	3	3	6		
		3	3	3	6		
		4	3	3	6		
		5	4	4	8		
		6	3	3	6		
		7	3	3	6		
Sum of Scores			22	22	44		
Sum of Scores					149	84.66 %	Very Valid

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From table 3, we can observe that didactics and construction component was very valid. But, technique component get valid. An average of all components validity get 84,66 % which is very valid. Generally, it appears that all module component get very valid result.

IV. CONCLUSION

Based on the result and discussion, it can be conclude that in this study it had been produced a problem based learning-oriented Module For$\mathbb{R}^3$ Analityc Geometry subject. From the result ofthe assesment of material and media expert it can be concluded that the module is very valid. The result of validity test showed that the feasibility of module was very valid with percentage 84,66 %.So, after this, researcher will ask students for their response to the module by using practicality questionnaire.

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