

THE VALIDITY OF PROBLEM-BASED LEARNING TEACHING MATERIAL FOR TEACHING BASIC STATISTICS TO GRAPHICS ENGINEERING STUDENTS

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Abstract:

This research aims to determine the validity of the problem-based learning module teaching materials in the basic statistics course for graphic engineering students at the State Polytechnic of Creative Media PSDKU Makassar. The type of research used is research and development concerning the 4D development model. The 4D development model consists of several phases: define, design, develop, and disseminate. The product developed is module teaching materials based on problem-based learning on basic statistics material. The test subjects in this research were graphic engineering students at the State Polytechnic of Creative Media PSDKU Makassar. The instrument used in this research was a validation sheet consisting of two validators from design experts and material experts. Based on the results of the research that has been carried out, it is obtained that the analysis of the validation results: (1) the feasibility of the graphic, namely 4.8 is in the very valid category, (2) the feasibility of the language, which is 4.8, is in the very valid category, (3) the feasibility of the content is 4.8 in the very valid category, and (4) the feasibility of presenting that is 4.8, is in the very valid category so that the average value of all aspects is 4.7 which is in the very valid category. So, the problem-based learning module teaching materials in basic statistics courses that have been developed are valid to be used as teaching materials in the learning process.

Keywords: Validity, Module, Problem-Based Learning, Basic Statistics

VALIDITAS BAHAN AJAR BERBASIS PROBLEM-BASED LEARNING UNTUK PEMBELAJARAN STATISTIKA DASAR BAGI MAHASISWA TEKNIK GRAFIS

Abstrak:

Penelitian ini bertujuan untuk mengetahui validitas bahan ajar modul berbasis problem based learning pada mata kuliah statistika dasar bagi mahasiswa teknik grafis di Politeknik Negeri Media Kreatif PSDKU Makassar. Jenis penelitian yang digunakan adalah penelitian dan pengembangan dengan model pengembangan 4D.

Model pengembangan 4D terdiri dari beberapa fase: pendefinisian, perancangan, pengembangan, dan penyebaran. Produk yang dikembangkan adalah bahan ajar modul berbasis problem based learning pada materi statistika dasar. Subjek uji coba dalam penelitian ini adalah mahasiswa teknik grafis di Politeknik Negeri Media Kreatif PSDKU Makassar. Instrumen yang digunakan dalam penelitian ini adalah lembar validasi yang terdiri dari dua validator meliputi ahli desain dan ahli material. Berdasarkan hasil penelitian yang telah dilakukan diperoleh bahwa analisis hasil validasi: (1) kelayakan grafik yaitu 4,8 berada pada kategori sangat valid, (2) kelayakan bahasa yaitu 4,8, berada pada kategori sangat valid, (3) kelayakan konten adalah 4.8 dalam kategori sangat valid, dan (4) kelayakan penyajian yaitu 4,8, berada dalam kategori sangat valid sehingga nilai rata-rata semua aspek adalah 4.7 yang berada dalam kategori sangat valid. Sehingga, bahan ajar modul pembelajaran berbasis masalah pada mata kuliah statistika dasar yang telah dikembangkan valid untuk digunakan sebagai bahan ajar dalam proses pembelajaran.

Kata kunci: Validitas, Modul, Problem Based Learning, Statistika Dasar

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INTRODUCTION

In essence, human history cannot be separated from education. Since the creation of Adam as the first human, Allah SWT has informed that Adam was taught various things, including various names of objects. After being taught the names of objects, Allah SWT. Then test his abilities by asking Adam to name all of them (Yusuf, 2018). Education has a very central role in improving the quality of human resources. The Law on the National Education System (Sisdiknas) shows education's strategic role in forming quality human resources. According to the law, Indonesian human characters are expected to be human beings who are faithful and devoted, have a noble character and personality, and are advanced, intelligent, creative, skilled, disciplined, professional, responsible, productive, and physically and mentally healthy. Effective efforts to shape human character like this can be made by improving education quality.

Science and technology are interrelated to improve human resources in a nation. One of the efforts made to improve human resources is improving education quality. Education is a conscious and planned effort made by a person to develop his personality and abilities so that changes and

developments in education are things that should happen in line with changes in the culture of life (Purnomo, 2012).

Education is a major factor in the formation of the human person (Atkinson, Richard, & Hilgard, 2011). The dynamic development of science and technology requires every individual to choose, receive and manage information to master technology and develop science. To select, receive, and manage information, critical, logical, systematic, and creative thinking tools are needed, one of which is mathematics. Mathematics is a basic science that can develop the ability to communicate using numbers and use the sharpness of reasoning to solve everyday problems.

Learning in the 21st century requires integrating learning with everyday life processes. One alternative is integrating several fields into STEM learning (Science, Technology, Engineering, and Mathematics) (Sagala, Umar, Thahir, Saregar, & Wardani, 2019). Mathematics education in educational institutions aims for someone to develop mathematical thinking skills and use them in everyday life. A person's experience with learning concepts at the elementary school level is critical to developing the beliefs and values they associate with mathematics. In a lesson, especially mathematics learning, the learning outcome that is higher than knowledge is understanding, for example, explaining something he has read or heard in his sentence, giving other examples from what has been exemplified, or using application instructions in other cases. In Bloom's taxonomy, the ability to understand is higher than knowledge. However, it does not mean that knowledge does not need to be asked because, to understand, it is necessary first to know or know (Sudjana, 2009). According to the principles and standards for NCTM school mathematics, factual knowledge, procedural facilities, and conceptual understanding are required for students to use mathematics (Lestari & Surya, 2017).

Universities as the highest educational institutions known for lectures; in the teaching and learning process, lecturers play an important role as facilitators to convey material so students can understand them. One of the courses at universities, especially in the graphic engineering study program, is basic statistics. The study of basic statistics is very broad. It should be realized that each student's ability is different, plus the learning process seems monotonous, making students less interested in paying attention to the material presented by the lecturer. The use of teaching materials that have

never changed from year to year is also one of the factors that students' low interest in learning impacts their learning outcomes.

Teaching materials are an important part of improving student learning outcomes and are deemed necessary to be designed to achieve the function of teaching materials (Ainun, 2019). It is necessary to pay attention to everything that supports the success of the learning process, such as considering concepts, types, and steps for selecting teaching materials to realize the function of teaching materials (Purnomo, 2011). The selection of certain approaches, models, strategies, and learning methods greatly influences students' attitudes and expected learning achievements. If a teacher only relies on the lecture method, it will make students bored in the learning process (Yakub, 2019).

Problem-Based learning is an approach where students are faced with problems and become accustomed to solving them through their knowledge and skills, developing inquiry, and getting used to building critical thinking and skillful problem-solving (Syamsidah & Suryani, 2018). The problem based learning model can improve problem-solving skills and students' scientific thinking skills and think based on scientific principles that are objective, methodological, systematic, and universal (Bakhtiar, 2004). Teaching materials can be a means of achieving competency standards and optimizing services to students through the use of teaching materials combined with a learning model, one of which is the problem based learning model.

Using teaching materials combined with a problem-based learning model consisting of various problem-based syntaxes can make the teaching and learning process more efficient and students' knowledge to increase. This is also in line with the research conducted by Siti Rahmayani and Heris Hendriana (2021) with the title "Validity of Teaching Materials Based on Problem-Based Learning Approaches in Statistics Materials". The study results indicate that from the validation of experts and field practitioners, teaching materials based on a problem-based learning approach are feasible to be tested on students as considered and assessed by expert validators. One of these studies was carried out by Refnywidialistuti (2021), Fida Lestari (2021), and Anggih Alfiantara (2016); they have conducted research related to the development and validity of problem-based learning teaching materials that are validly applied to mathematics learning in the classroom.

RESEARCH METHOD

The method used in this study is a model of research and development. The research model is the development of research methods used to produce a specific product and test the effectiveness of the product (Sugiono, 2009). The products that will be developed in this research are teaching materials in the form of modules based on problem-based learning models on basic statistics material. This research was conducted at the Makassar Creative Media State Polytechnic, at Jalan Perintis Kemerdekaan VI No. 50 Kec. Makassar City Tamalanrea. The subjects of this research are Graphic Engineering students for the 2021/2022 academic year. The module that has been developed was tested on 20 students of the Graphic Engineering Study Program. The material to be tested is basic statistics material. The implementation of product trials was carried out in seven meetings, including the provision of learning outcomes tests.

The development model used in this research is the 4D development model. The 4D development model consists of several phases: defining, designing, developing, and disseminating. The instrument used in this study was a questionnaire validation assessment sheet with data collection techniques through a validation test carried out by asking for expert judgment, namely two lecturers consisting of material experts and design experts. The validity test was carried out on four aspects, graphic validity, language validity, construct validity, and module view. Analysis of the level of validity of the module using the criteria for the validity of teaching materials can be seen in the following table.

Table 1. The Criteria for Each Aspect of Validation of Teaching Materials

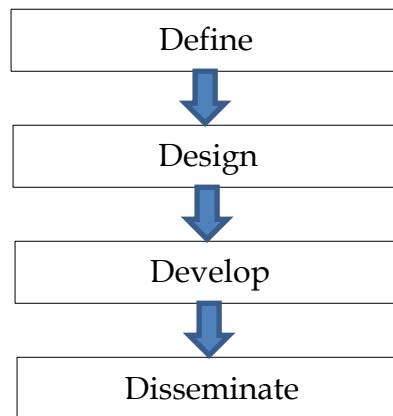
Average Score	Classification
$4,0 \leq V \leq 5$	Very Valid
$3,0 \leq V < 4,0$	Valid
$2,0 \leq V < 3,0$	Quite Valid
$1,0 \leq V < 2,0$	Less Valid
$V < 1,0$	Not Valid

RESULTS AND DISCUSSION

1. Result

Problem-based learning teaching materials have been developed with a 4D development model consisting of 4 stages, define, design, develop, and disseminate. However, the dissemination stage could have been carried out

better due to time and cost constraints, so it was only disseminated to other mathematics lecturers for use in other classes. The explanation of these development stages can be described as follows.



Gambar 1. Development 4D Model

a. Define

At this stage, an analysis is carried out by reviewing the Semester Learning Design (RPS) and several relevant references used in basic statistics material through aspects of construct validity and module view.

b. Design

The preparation of the design is done by compiling the framework of teaching materials by selecting materials or problems in accordance with the basic statistics of basic material by selecting reference images or information to complete the module teaching materials and framing the layout of the material on the module teaching materials in accordance with the preparation of the material topics.

c. Develop

At this stage, modifications are made to the initial form of learning materials prepared at the defined stage through validation tests. Based on the validity test using the validity assessment sheet instrument, the following results were obtained.

Table 2. The Validation Results of Teaching Material

No.	Score	Classification
Graphic Validity	4,8	Very Valid
Language Validity	4,5	Very Valid
Construct Validity	4,8	Very Valid
Module View	4,7	Very Valid
The Total Of Average	4,7	Very Valid

Table 2 above shows that the average value of the test results for the validity of the problem-based learning module teaching materials is 4.7, with very valid criteria. This shows that the module teaching materials produced in this research are valid. Both the components of graphic validity, language validity, construct validity, and module view can be used with minor revisions. Revisions are made in accordance with the responses and suggestions given by each expert, either directly or written in the suggestion column. The suggestions from the expert team can be seen in the following table.

Table 3. Suggestions and Improvements

Suggestions	Improvements
The module cover used still needs to be improved	Revise the cover of the module used to make it more attractive.
The design of the content of the module must be attractive.	Redesigned the content of the module to make it more interesting.
The arrangement of sub-chapters of material must be systematic.	Make a more systematic arrangement of sub-chapters of material
Images contained in the module should include the source	Include a source for each image.
Each sub-topic must contain learning activities that are in accordance with the problem-based learning syntax.	Create learning activities using problem-based learning syntax in each sub-topic
We recommend that the design of the content of the module does not contain animated images that are not important and unattractive.	Eliminate unnecessary and interesting animated images.

d. Disseminate

Teaching materials obtained at the final stage of development are then distributed on a wider scale, for example, in other classes and institutions. However, in this research, the dissemination stage could have been carried out better due to time and cost constraints, so it was only disseminated to other lecturers for use in other classes and other study programs.

2. Discussion

Teaching materials have an important role in learning, so the development of teaching materials must be appropriate and in accordance with learning needs to be able to improve the abilities of students. The process of developing teaching materials has certain rules and regulations in accordance with the development model carried out. The development model used is a 4D development model with steps defined, designed, developed, and disseminated. One of the core stages is conducting a validation test. The validation test is carried out as an effort to produce good teaching materials that are relevant to the theoretical basis of development. The feasibility test is also very important to ensure whether or not the teaching materials are used in the learning process (Akbar, 2013).

Based on the analysis of the validation assessment sheet instrument conducted by two lecturers consisting of material experts and design experts, the average validation value was 4,7, with very valid criteria. This shows that the problem-based learning module teaching materials are suitable for use by lecturers in the learning process and the desired aspects in this study. These aspects include graphic validity, language validity, construct validity, and module view.

The problem-based learning module teaching materials were declared very valid by the two validators with an average value of 4.8, judging from the graphics. This shows that the size of the module teaching materials is in accordance with ISO standards, namely A4 size (210 x 297 mm), the font size and the color of the title of the module teaching materials used are attractive, proportional, and easy to read and do not use too many types of letters. In addition, the appearance of the layout elements on the front and back covers harmoniously match and are consistent. This is in line with what was conveyed by Daryanto (2013) that the consistency of graphic selection needs to be considered to ensure users understand. The consistency used will have an

impact on the convenience of students in using problem-based learning modules.

The problem-based learning module teaching materials were declared very valid by the two validators with an average value of 4.5, judging from the aspect of language. This shows that the language used in the module teaching materials is in accordance with the correct Indonesian language rules, both in terms of readability and clarity of information. The use of language in the teaching materials of this module pays attention to accurate and communicative language in accordance with the level of education, namely clear, straightforward and communicative. The use of language also pays attention to proper spelling, punctuation, and mechanical aspects in accordance with Enhanced Spelling guidelines. The choice of words and sentence structure is adjusted to the rules of good and correct Indonesian. This is in line with what was stated by Sitepu (2015), which states that language uses certain rules so that messages in the form of ideas and feelings of the sender can be conveyed appropriately.

Problem-based learning module teaching materials were declared very valid by the two validators with an average score of 4.8, judging from the aspect of content feasibility. This shows that the material contained in the module teaching materials is in accordance with the Semester Program Plan and Graduate Learning Outcomes and Course Learning Outcomes to be achieved in problem-based learning module teaching materials, which are a summary from several sources so that it can make it easier for students to learn and understand the material in accordance with the applicable curriculum. This is confirmed by Prastowo (2011), who argues that the substance of good teaching materials in order to achieve predetermined competency standards and basic competencies includes knowledge, skills, and attitudes.

The problem-based learning module teaching materials were declared very valid by the two validators with an average value of 4.7, judging from the aspect of presenting the material. This shows that the material contained in the module teaching materials is systematically arranged. The presentation of concepts in the module's teaching materials only gives rise to a few interpretations, the material is according to the student's abilities, and the illustrations can support the clarity of the material. In addition, problem-based learning module teaching materials are equipped with real problems in the surrounding environment so that students can easily understand the material and apply it in everyday life. Examples of problems exist around the learner's

environment in accordance with a problem-based approach that presents real-world problems as a learning context. In line with the research conducted by Nurhidayanti (2017) with the title development of problem-based mathematics teaching materials to facilitate the achievement of reasoning ability on comparative subjects with the validity level of the valid category, the problem-based approach is a solution to provide meaningful learning in learning activities.

CONCLUSION

Based on the results and discussion of this study that the problem-based learning module teaching materials were developed with a 4D development model in basic statistics material in the graphic engineering study program through a validation test using an assessment sheet instrument, the results of the validation analysis were obtained in aspects: (1) of the graphic validity, namely 4.8 is in the very valid category, (2) of the language validity is 4.8 is in the very valid category, (3) the construct validity is 4,8 in the very valid category and (4) of the module view is 4.8, it is in the very valid category so that the average value of all aspects is 4.7 which is in the very valid category. So, the problem-based learning module teaching materials in basic statistics courses that have been developed are valid to be used as teaching materials in the learning process. This module is equipped with five problem-based learning syntaxes which are poured into modules consisting of observing problems, let us discuss, digging up information, making reports, and let us share. This is characteristic of the problem-based learning module teaching materials produced in this study which are different from the modules used by previous students.

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