

Development of structured modules to improve the mathematical understanding of the circle concept in class VIII Mataram 17 junior high school

Mahsup¹ and Y S Anwar¹

¹ Department of Mathematics Education, Muhammadiyah University of Mataram

Email: supyeka@gmail.com

Abstract. The purpose of this research is to produce a structured module product to improve the understanding of the concept of circles in class VIII Mataram 17 Junior High School. The development model used in the development of this learning module is Dick and Carey's model of development. The type of data on this development is quantitative and qualitative data. Data collected in the form of polls, interviews, and tests. While the data analysis using qualitative descriptive analysis techniques and descriptive statistical analysis. Based on the expert assessment that the validity of the module content is in the first category with a percentage turnover of 96.4%, and the validity of the learning design is in an outstanding category with a percentage turnover of 93%. The results of the small group trials on the students gave the module assessment in the excellent class with a percentage of 82.05%, while in the field trials, students give evaluation results on the modules are in a proper category with a rate of 80.85%. Results of analysis of pretest and Postes obtained price t count 21.415, T price of table 1.69, which means t count > T table (very significant). Thus learning by using modules can improve the understanding of the circle concept.

1. Introduction

In government Regulation (PP) Number 19 of 2015 article 17, it is in charge that teachers are expected to develop learning materials. It was then emphasized through the regulation of the Minister of National Education (Permendiknas) Number 41 the year 2015 on the process standard, which among other things, governs the learning process planning that requires educators in the education unit to Develop a learning plan. Teachers also prepare the material to be taught. Such as choosing the appropriate textbook or creating your articles to be shown are packaged in the form of modules [8].

Teaching materials that can be developed by delivering simple materials and learning activities and attracting students to learn is a module. The advantages of the blade as a teaching material can be gained in various places, independent or not to be studied in groups, and can be studied flexibly. The teacher can develop the module according to students' needs and characteristics. Through the teacher, the module can integrate several essential competencies into a theme. The theme chosen by the teacher can be adapted to a student's cognitive development and adapted to the environment of the students [4]. Teachers as educational elements directly involved in learning in class are required to have competence in using and developing modules in the form of modules [5].

Modules are an essential part of implementing education in schools to help students understand concepts, procedures, and theories [7]. The usefulness of teaching materials in learning include the following; (1) able to provide varied stimulation to the brain, so that the brain functions optimally, (2) can overcome the limitations of the experience possessed by students, and (3) provides opportunities for students to learn independently, at a place and time and speed determined by themselves [6]. Degeng [2], also explained that modules published for use in schools today, the authors often do not consider the content structure of the field of study for learning purposes. The contents of the textbook use a disciplinary approach rather than a learning methodology approach, so it often seems that there is no link between one chapter and another, or parts of a more detailed section. Module development must be able to answer or solve problems or difficulties in learning.



From the results of preliminary observation in the field, obtained data about the situation and condition of learning mathematics at Mataram 17 Junior High School. The author's findings are about a lack of interest and motivation for students to learn to use the book of packages and teaching modules that are used as a reference, especially in class VIII mathematics subjects. As a result of the students' lack of interest and motivation, the ability to understand concepts, especially in the material circles, is very lacking. Among the difficulties of students in solving problems about the ring if it is associated with daily life or given a more complex issue, and students can only work on routine matters.

Also, the dependence of the learning resources in the form of package books used as a reference by teachers and students of Mataram 17 Junior High School still less appropriate to the needs and characteristics of students, so even having difficulties. If the homework is given happens is most of the results of one homework with the other, this means students' independence in mathematics learning is also lacking.

The students' difficulties in studying the textbook are caused by the material that is overly complicated and still unfamiliar to the students, so the students do not understand if they read it themselves, the text design is in the form of writing, and the picture is not good [11]. According to Weidenmann that seeing a photo/picture is more meaningful than reading or listening. Through reading the information that can be memorized are only 10%, from attending the remembered are 17%, and from seeing a picture/drawing, 30% information is retained. Well, designed photos/images can provide a better concepts understanding.

Similarly, interviews with some mathematics teachers as well as some students of Mataram 17 Junior High School. During this study, mathematics, especially students of VIII, have never used modules as teaching materials. Students and teachers use a limited book of packages, so not all students get a book. To overcome the lack of a package book part of the mathematics teacher using a worksheet that is not the teacher-made own. Some of the reasons teachers use the sheet that in the spreadsheet are readily available in the material summary, student work, and exercise so that the teacher can directly use it and the price is affordable by the students.

Based on the need analysis can be known that at SMPN, 17 Mataram teachers, especially teachers of mathematics subjects, have not yet had the relevant module teaching materials. This learning module also comes with a guide for teachers. It is hoped that students are more motivated and more comfortable to understand the content contained in this learning module, thus following the concept of mathematical materials, especially on the material circles for the better.

The purpose of the development of this research is: "Producing a structured product to improve understanding of the concept of circles in class VIII Mataram 17 Junior High School".

2. Methodology

2.1 Types of research

This type of research is development research with the development model of Dick and Carey. This Model consists of 9 steps, namely: (1) Determining the purpose of learning (2) conducting analysis (3) Recognizing the behavior of input and the students' traits (4) Formulating performance objectives (5) Develop benchmark reference test items (6) Developing learning strategies that are in line with learning conditions (7) Developing and selecting learning materials, (8) Designing and implementing formative assessments, (9) revising learning materials. The ninth step can be seen in the following chart.

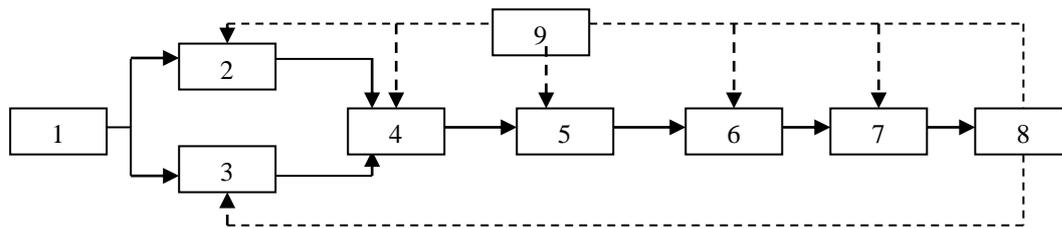


Figure 1. Model approach Dick system & Carey (2001)

2.2 Trial Product

The module, as a result of development, must pass a series of trials to determine its validity level. Module validity levels can be known through expert review analysis results, small group trials, and field trials.

2.3 Data type

The type of data on this development is quantitative and qualitative data. Data Information obtained using polls and tests. A survey consists of a product test poll. The test consists of an initial examination and a final inspection. Quantitative Data in the form of information obtained from a survey is changed in the way of a percentage and is explained qualitatively. While qualitative data in the form of inputs, responses, and suggestions for improvement based on the results of expert assessment obtained through a poll with learning planning experts, the content experts study and poll for students.

2.4 Data Collection Techniques

The data collected in this development study uses poll and test techniques. Anglet is used to manage the review data from the Expert content, design experts, small group tests, and field trials. This poll technique is equipped with instruments in the form of poll format. The test is used to determine the student's learning outcomes before using the pre-test module, and after using the Learning modules (posttests).

2.5 Data Analysis

In this development study used two data analysis techniques, namely qualitative descriptive analysis techniques and descriptive statistical analysis. This qualitative descriptive analysis technique is used to process the results of an expert review of the content of subjects, learning, and student design. This data analysis technique is done by grouping information from qualitative data that includes feedback, feedback, criticism, and repair suggestions contained in polls. The results of this data analysis are then used as a reference for revising learning module products. This descriptive statistical analysis is used to process the data obtained through the poll in the form of descriptive percentages. A descriptive statistical analysis technique is also used to process the data in the form of pretest and posttest results, so it is known that the level of effectiveness of development products is produced as a consequence to see the improvement of concept understanding Circles through learning with modules.

3. Results And Discussion

3.1 Development Results

The development of a module on the circle concept was successfully developed using the Dick development model & Carey. Here are displayed development results according to the model is; (1) Determining learning objectives, at this stage, found the problem that students had difficulty in understanding the concept of circles so that the problem encouraged them to develop a teaching module oriented to explain the concept of Circle. (2) Conducting a learning or instructional analysis,

at the stage has succeeded in formulating the general competencies that have been determined at step 1 then broken back into more specialized skills. (3) Recognizing the behavior of the students' input and traits at this stage, they know the original ability and characteristics of the students. (4) Formulating the performance objectives, at this stage, can formulate indicators of competency achievement. (5) Develop benchmark reference test items, this will be able to measure students' behaviour according to the criteria stated in the learning objective, (5) Develop benchmark reference test items, at this stage acquired evaluation tools that can be Measuring the level of achievement of students' behavior set in essential competencies, (6) Developing strategies, at this stage can be assigned individual and group learning strategies. (7) Develop and select learning materials; at this stage, the learning materials are arranged based on the content of knowledge that has been described in the competency standards and necessary competencies. At this stage, the module has been compiled based on the instructional analysis results. The process of drafting a module is based on the results of the analysis of needs, scope of circle theory, research results, and the experience of researchers. The material is presented using communicative words that aim to allow students to understand the message conveyed quickly. To make it easier for students to understand the content, the teaching book also comes with tables, drawings, and some basic examples.

The validity of the modules is assessed through three aspects of the content validity and the validity of learning design. To know the validity of these two experts is used with the details of one person judging the aspect of the content, and one expert again assesses the design aspects of learning. Based on the expert assessment that the validity of the module contents is in the top category with a percentage turnover of 96.4%. The validity of the learning design aspects is in top categories, with a percentage turnover of 93%. Besides the validity of these two aspects, the module was also assessed by students during small group trials and field trials. In small group trials, the student determined that the blade was in a proper category with a percentage of 82.05%, while the student field trials gave assessment results on the modules were in functional groups with a rate of 80.85%.

On the development model to (8) designing and implementing a formative assessment, at this stage obtained the results of pre-test scores and students' posts on understanding the concept of the circle obtained T-count value = 24.415 and t-table value = 1.69 so that it is obtained T-count > T-table (very significant). Thus learning by using learning modules can improve the understanding of the circle material concept.

4. Conclusion

The module was successfully developed using the Model, Dick, and Carey [1]. This Model guides the module development steps to be more systematic and minimizes the occurrence of errors at every stage of development. Based on the expert assessment that the validity of the module content is in the top category with a percentage turnover of 96.4%, and the validity of the learning design is in an outstanding category with a percentage turnover of 93%. The results of the small group trials on the students gave the module assessment in the excellent class with a percentage of 82.05%, while in the field trials, students give evaluation results on the modules are in a proper category with a rate of 80.85%. Results of analysis of pretest and Postes obtained price t count 21.415, T price of table 1.69, which means t count > T table (very significant). Thus learning by using modules can improve the understanding of the circle concept.

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