

# Set Design Module Development Based on Guided Discovery Learning Model

Rohma Nuraini,<sup>1</sup> Master Of Mathematics Education, University of Ahmad Dahlan, Indonesia  
Suparman, Master Of Mathematics Education, University of Ahmad Dahlan, Indonesia

**Abstract:** *Understanding basic concepts in problem solving is very important for students. This will affect the student learning experience. This study aims to design modules to improve students' ability to find basic concepts that will be used in problem solving. The method used is the ADDIE model which consists of analyze, design, development, implementation. This research is only limited to two stages, namely the Analyze and Design stages. Data collection instruments in the form of questionnaires, observation guidelines, and interviews. The subjects of this study were teachers and junior high school students. This study resulted in the design of learning modules in accordance with student characteristics, curriculum analysis, and concept / material analysis. This design has the advantage of improving the understanding of students' basic concepts in problem solving which refers to learning based on Guided Discovery.*

**Keywords:** *List module, Guided Discovery, problem solving.*

## INTRODUCTION

Mathematical problem solving is a process that uses the strengths and benefits of mathematics in solving problems which are also a method of finding solutions through the stages of problem-solving (Devi Eganinta Tarigan, 2012). Problem-solving is an activity that can produce HOTS (Higher Order Thinking Skills) thinking in students (Abdullah, Abidin, & Ali, 2015). Problem-solving as a process is an activity that prioritizes the importance of the procedure, the students took the steps in solving the problem and finally can find the answer to the question not only on the answer itself (Tina Sri Sumartini, 2016). According to (Sumarmo, 2000) problem solving is a process to overcome difficulties encountered to achieve the desired goal.

Problem-solving is part of the mathematics curriculum which is very important because in the learning process and its completion, students are allowed to gain experience using the knowledge and skills that they already have to be applied to problem-solving (Dwi Priyo Utomo, 2012). (Tambychik & Meerah, 2010) Students must learn mathematical problem solving because it plays an essential role in everyday life. As in (Leo Adhar Effendi, 2012) problem-solving abilities must be owned by students to train to be accustomed to facing various problems, both problems in mathematics, problems in other fields of study or difficulties in everyday life that are increasingly complex. The importance of problem-solving ability in learning mathematics because in solving mathematical problems, students are asked to be able to use non-routine skills and experiences is one of the particular characteristics of mathematical problems (Sciences et al., 2018).

In problem-solving students must be able to understand the use of basic mathematical concepts with systematic steps so that the problem-solving process is natural and directed. Following the central vision of mathematics education that mathematics education is devoted to understanding mathematical concepts and ideas which are then applied in solving routine and non-routine problems through reasoning, communicating, and developing connections in mathematics and so on. This is consistent with previous research, namely (Saragih & Habeahan,

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<sup>1</sup> Corresponding Author: First Name Last Name, Work Postal Address/Physical Address, Department, Affiliated Organization, City, State, Postal Code, Country. email: address@email.edu

2014) in problem-solving, it is often found that students only care about the final answer without understanding how the process is. Students also often find it difficult to determine what concepts are used to solve problems. (Hendriana, 2012) states students tend to memorize mathematical concepts and definitions without understanding the meaning of their contents. These trends have an impact on mathematical problem-solving abilities that are less satisfying. In learning, basic understanding concepts is an essential thing that students must have. If students accept the basic idea that is wrong, it will be difficult to correct it, especially in the application of mathematical problem solving because understanding basic concepts makes it easy to improve students' procedural knowledge.

However, based on data from the interview at SMPIT Tunas Mulia shows that when students are given a description of the concept of understanding, most students are unable to solve it. This can be seen from the process of resolving students' answers, only some students answered with the right steps and answers. Of the students whose answers were less found some errors in answering questions, including concept errors, facts, procedures, and principle errors. Also, if given a question different from the existing example students tend to ask the teacher which formula to use. This means that students do not understand the basic concepts, do not know the purpose of the problem, and cannot translate questions into mathematical models. If the basic concepts that students receive are wrong, then it is difficult to fix them again, especially if they have been applied in solving mathematical problems. Strong concept knowledge will provide convenience in improving students' mathematical procedural knowledge. Students will find it very difficult to go to a higher learning process if students have not understood the concept correctly.

One learning model that guides students to learn the basic concepts is the Guided Discovery model. Guided Discovery is not a learning model that is done to find truly new knowledge, but this model, students are expected to actively find knowledge such as guessing, estimating, and trying so that students can find concepts, formulas and the like with the guidance teacher (Yuliani & Saragih, 2015). (Wulandari & Setianingsih, 2018) Guided Discovery can be defined as situation learning, where the teacher does not give the main content directly from the material but should be found independently by students. So, this learning will make students active in their learning. According to (Bamiro, 2015) in this strategy, the teacher guides students in learning tasks by asking thoughtful questions that will help produce the right idea about the subject matter. Guided discovery, namely the extent to which student involvement in classroom activities is under the guidance of the teacher and how many teachers activate the student's thinking process (Achera, Belecina, & Garvida, 2015). According to (Noviyanti, 2017) is a process in which students are involved in their learning, formulating questions, investigating extensively and then creating new understanding, meaning and knowledge. Through these activities, students will create or build further understanding and knowledge. This is in accordance with the constructivism theory that all knowledge is obtained by itself. (Hafiz, Darhim, & Dahlan, 2017) Guided discovery is a learning activity designed in such a way that students can discover concepts or principles independently through mental processes.

The development of learning media needs to be carried out continuously, following the needs and progress of students. The challenge now is to make learning media exciting and must be practical and educational. Modules include learning media that can be used as learning resources. The blade is a solution to empower students' critical thinking skills because the module contains material that is equipped with a series of activities, training, and self-assessment to monitor the level of student learning mastery, and more (Sunarno & Wikara, 2016). (Analysis & View, 2017) Modules are instructional learning materials whose contents are relatively short and specific which are arranged to achieve learning objectives. This module usually has a series

of well-coordinated activities related to article, media, and evaluation. The module learning system is individual learning that is carried out explicitly learning objectively and used mastery of the principles of learning. A functional module will grow from student learning motivation so that student learning achievement continues to increase.

Based on the results of the needs analysis that has been done it is known that the teaching materials used by the teacher are student books and teacher books from the Education Office. This is consistent with previous research (Fajarini, Soetjipto, & Hanurawan, 2016) Although there have been teacher books and student books that have been scientifically charged, the teacher is still confused to apply them when learning because it is still too general and sometimes the content is not close to a student. Teachers need simple companion teaching materials, make students interested and can learn independently and familiarize students to solve problems more independently.

This article aims to answer the following questions. First, how is the learning process in class? Second, what is the learning model used by the teacher? Third, how to know the level of students' mathematical reasoning. Fourth, how to design student worksheets based on the Guided discovery in solving mathematical problems. This article consists of four parts. The first part outlines the introduction. The second section describes the research method. The third section provides results and discussion. The fourth section presents conclusions and further expansion of research.

## METHOD

The research method used in this study is research and development (R & D) method with the Analyze, Design, Develop, Implement, and Evaluation (ADDIE) model. One of the functions of ADDIE is to become a guideline in building useful and dynamic tools and infrastructure for training programs and supporting the training performance itself. Visually ADDIE stages can be seen in Figure 1.

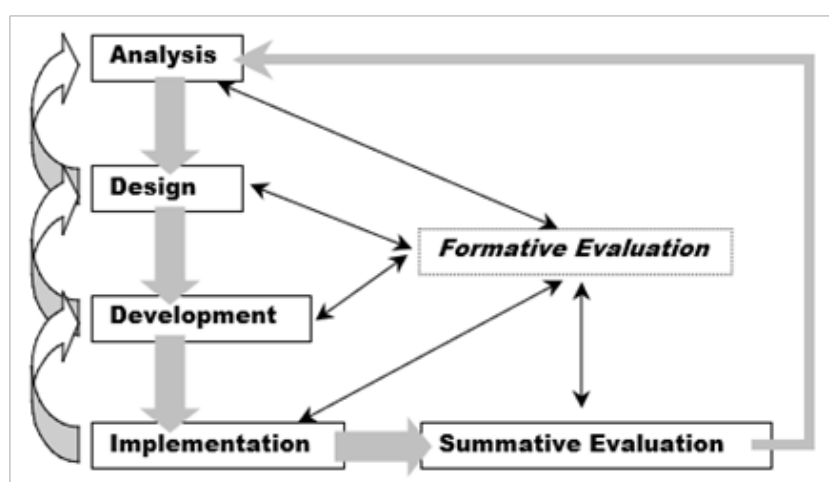


Figure 1. ADDIE Mode I (McGriff, 2000)

This rule is demonstrated by the paragraph you are currently reading. However, this study is limited to two stages, namely the Analyze and Design stages. In the Analyze stage there are three analyzed, namely concept / material analysis, curriculum analysis, and analysis of student characteristics. The analysis is the basis for knowing the needs of teachers and students in learning and developing quality products in the form of mathematics learning modules. Students need modules that can lead to the discovery of basic concepts so that the concept can be used

in solving problems. The use of discovery-based learning modules will train students to find basic concepts and will improve students' thinking processes. The material used is the set of class VII odd semester junior high school. Design or design stage, at this stage the activity carried out by the researcher is to formulate the design or initial product-specific framework of modules based on guided discovery, collection of references that are used as a reference in product development.

Data collection instruments used were non-tests, namely questionnaires to retrieve feasibility data, observation guidelines, interviews. This study uses a feasibility questionnaire taken from ahlimateri, media experts, and response students. The type of data taken is qualitative and quantitative data. Qualitative data in the form of student characteristics, depth and breadth of material, as well as criticism and input from material experts and media experts through validation results. Validation sheets consist of module validation sheets and student response questionnaire validation sheets. (Goes, Sinhoreti, Consani, & Silva, 1998). To find out the validity of the reference module, instrument module validation is used. Whereas for quantitative data in the form of a score of the results of the feasibility test. The data analysis technique used in this study is descriptive data analysis techniques. The subjects of this study were seventh grade students of SMPIT Tunas Mulia Wonosari.

To find out the practicality of the reference module using the teacher response questionnaire instrument, student questionnaire responses, and interview guide. Data that has been obtained through questionnaires by product assessment experts and students in the form of qualitative values will be changed to quantify Likert scale. Quoted from (Journal of extension., Nd) the Likert scale used is a series of questions with five alternative responses: strongly agree (SS), agree (S), sufficient agreement (CS), disagree (TS), and very disagree (STS).

## **RESULTS AND DISCUSSION**

This research was conducted by designing the development of mathematics modules based on Guided Discovery for seventh grade junior high school students. The following are the results of the development design with the Analyze and Design stages:

### ***Phase Analyze Results***

Phase Analyze is carried out by analyzing three aspects namely curriculum analysis, concept / material analysis, and analysis of student characteristics. The results of the analysis are:

Curriculum analysis is focused on the analysis of core competencies (KI) and basic competencies (KD) that are listed in the content standards that refer to graduation standards. Curriculum analysis as a guide in developing modules based on Guided Discovery for seventh grade junior high school students. The results of the KI and KD analysis contained in the content standard are translated into indicators of achievement of competence.

Concept / Material Analysis aims to determine the content and learning materials needed in the design of module development based on Guided Discovery. The secondary learning materials for odd semester VII grade are numbers, sets, algebraic forms, linear equations and inequalities of one variable. Teaching materials used as learning resources in the form of student books and LKS that are not made by the teacher but are already available from school. The use of language in student books and worksheets is sometimes difficult to understand, the material is many that go directly to concepts / formulas, not directed through learning steps to find the basic concepts and the questions given have high difficulty.

Results of analysis of student characteristics: Analysis of student characteristics was carried out to determine the character of students, including age, student preferences, student activities in learning, and difficulties encountered by students in using pre-existing learning resources. The age of class VII students of SMPIT Tunas Mulia ranges from 12-13 years. The presentation of the module is designed using attractive colors, sentences that are considered important are bolded, italicized or given a specific symbol. Also equipped with pictures in everyday life that describe the subject matter in the set so that students do not consider the material abstract. Language and the use of sentences in the module are adapted to the level of development of seventh grade junior high school students, so that students can use and learn modules more easily. The steps in Guided Discovery learning use the problems of everyday life with students

### Design Phase Results

Design phase or module preparation is done by drafting the module followed by compiling module components that are adapted to the daily problem-The mathematics module for learning based on Guided Discovery in the material of the seventh grade junior high school student association consists of three parts, namely the beginning, the core, the final part.

### The initial part of the module contains

The cover of the mathematics module is entitled “Guided Discovery Based Mathematical Module”. On the cover (Figure 2) is a mathematical module cover design that is given the author’s identity and grade VII / MTs level

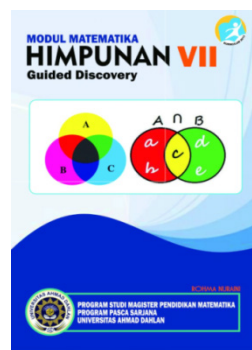


Figure 2. Cover

On the title page (Figure 3) is the design of the module title and level identity, the identity of the author, the identity of the supervisor and the validator.

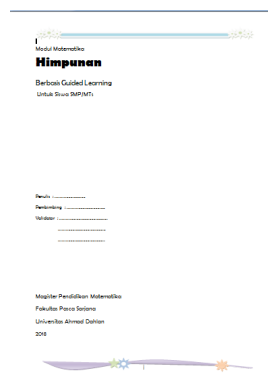


Figure 3. The Title Page



Concept maps (Figure 7) are designed to facilitate students in learning the material set and the achievement of material.

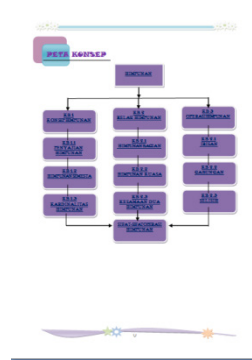


Figure 7. Concept maps

The contents of the module contain learning activities that are in accordance with the learning steps based on Guided discovery and evaluation of learning activities. The material that will be compiled in this module is the set that is broken down into 4 learning activities (KB). Each learning activity is equipped with a motivational sentence in the Let's Let's Reflect section, keywords in finding the basic concepts in the Keywords section, and a problem to find out the understanding of each submitter in the KB Evaluation section. The module is prepared based on the Guided Discovery stages, which are formulating the problem, analyzing the problem, compiling the conjecture, conclusion and applying the conclusion. According (Kadir & Satriawati, 2017) defines learning that gives students the freedom to investigate mathematical problems through the following steps: (1) formulating problems, (2) formulating hypotheses, (3) testing hypotheses, (4) drawing conclusions . (Adelia & Surya, 2017) Guided discovery steps are as follows: 1. Stimulus (leave questions or encourage students to observe pictures and read books about material) 2. Statement of problems (providing opportunities for students to identify many problems relevant to teaching materials) 3. Data collection (giving students the opportunity to gather information) 4. Data processing (processing data that has been obtained by students) 5. Verification (do a careful examination to verify the validity of the hypothesis) 6. Generalization (holding conclusions). As stated (Maarif, 2016) the discovery method with three stages, namely: 1) clarification, 2) draw conclusions inductively, 3) validate (verify).

The learning steps with guided discovery are as follows:



Figure 8. formulate the problem

**Menganalisis Masalah**

Persamaan Kelompok Hewan

Pada gambar 1 (Hewan jenis 1) yaitu:

1. ....
2. ....
3. ....

Pada gambar 2 (Hewan jenis 2) yaitu:

1. ....
2. ....
3. ....

**Menyusun Konjektur**

1. Apakah Gambar 1 (Jenis Hewan 1) memiliki persamaan? Apa saja persamaannya?  
.....  
.....
2. Apakah Gambar 2 (Jenis Hewan 2) tidak memiliki persamaan? Apa saja perbedaannya?  
.....  
.....

Figure 9. analyze the problem and compile the conjecture

**Kesimpulan**

Berdasarkan permasalahan di atas diperoleh kesimpulan bahwa :

Pada gambar 1 (Hewan jenis 1) merupakan .....

Karena memiliki .....jenisnya dan .....anggota dari kelompok tersebut

Pada gambar 2 (Hewan jenis 2) merupakan .....

Karena .....memiliki .....jenisnya dan .....anggota dari kelompok tersebut

Figure 10. Conclusion

The final section contains competency tests, bibliography, glossaries, and answer keys. Competency testing on module design is structured to test students' knowledge in finding the basic concepts of the set. Bibliography contains references made as sources in the preparation of modules. The glossary contains terms and their meanings and the answer key is the key to the questions that are done .

## CONCLUSION

This study designs a mathematical module with two stages. The analysis phase produces an analysis of student characteristics, curriculum analysis, concept / material analysis. For the design stage there are three parts, the initial part is the cover, title, preface, table of contents, introduction section and concept map. For the contents section contains material and problem solving in accordance with the learning steps. Modules designed to refer to Guided Discovery-based learning include the stages of formulating a problem, analyzing a problem, constructing a conjecture, conclusion, and applying a conclusion.

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#### ABOUT THE AUTHORS

**Rohma Nuraini:** Students in the Master of Mathematics Education, University of Ahmad Dahlan, Yogyakarta, Indonesia.

**Suparman:** Associate Professor, Department of Mathematics Education, University of Ahmad Dahlan, Yogyakarta, Indonesia.