# Practicality Of Mathematics Learning Tools Based On Discovery Learning For Topic Sequence And Series

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**Abstract:** Mathematics as a learning subject is widely used in everyday life should be liked by students. But, the fact showed that the implementation of mathematics learning is still not related to our daily life. One of the causes is learning tools that are not in accordance with the demands of the curriculum, one of which lies in the learning models. Discovery learning is a learning model matched the characteristics of mathematics learning. The aims of this research is developed the mathematics learning tools based on Discovery learning for topic sequence and series. The type of research is development research using Plomp Development Model. The result of preliminary research is required learning tools based on discovery learning. The results showed the practicality of learning tools is very practical.

**Index Terms:** Discovery learning Models

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## 1. INTRODUCTION
National education purposed for intelligence nation life[1].Based on this,the objectives of mathematics learning that taught at the school gain the critical thinking, logically, analytically, creatively, problem-solving skills, and the ability to communicate ideas and resilience and confidence in solving problems in everyday life[2].Learning begins with teachers giving problems in everyday life that the students have to solve.This can be done if the teacher designs an interesting learning activity and encourages students to find concepts and solve problems. To support learning activities like this then the teacher in learning can use learning media such as Student Worksheet (LKPD). Based on observations made on May 4th, 2016 at three senior high school on the Pesisir Selatanwhich is implements 2006 curriculum and Curriculum 2013 including SMAN 1 BatangKapas, SMAN 2 Painan and SMAN 3 Painanshowed mathematics learning tools that used by teacher in the school has not yet facilitated the students to be active.One example in the lesson plan explains that the teacher directly gives the concept of material instead of students who find the concept of the material through the guidance of teachers so that students are not active in learning activities. In the learning activities, the teacher explains examples of questions and students are asked to ask if there is material and examples of questions described are not understood by students and students are asked to do the exercises. In addition, teachers have not linked learning materials with the problems that exist in everyday life. One of the learning models that requiresstudents to find their own mathematical concepts and solve problems is the Discovery learning Models. Discovery learning suitable for mathematical learning.Discovery learning can improve the ability of mathematical representation and confident of students[3]. To apply the learning model of Discovery learning in the classroom, must follow the steps of learning model that is:1) **Stimulation**t he students is confronted with something that creates their confusion, and raises a desire to investigate on their own, 2) **Problem statement** students are given the opportunity to identify issues relevant to the subject matter, then formulated in hypothetical form, 3) **Data collection** students are asked to gather as much relevant information as possible to validate the hypothesis 4) **Data processing** is an activity to process data and information that has been obtained by students, 5)

**Verification** students do an examination to prove the truth of the hypothesis, 6) **Generalization** is the stage of making a conclusion[4]. Discovery learning is proven in improving the quality of learning compared to conventional methods, and students can improve their knowledge during the learning process [5]. Discovery learning modelsis a learning model that tries to lay the groundwork and develops a way of scientific thinking, the students is placed as a learning subject,the role of the teacher in this model is a learning coach and learning facilitator [6]. Discovery learning activities in general can help in understanding language skills and assist students in responding to a learning strategy[7]. Learning tools include lesson plan (RPP) and students worksheet (LKPD). Lesson plan (RPP) is a plan that describes the procedures and organizing of learning to achieve a basic competency set out in the Content Standards and has been elaborated in the syllabus [8]. In general, in developing RPP should be based on the principles of RPP development, ie: (1) the competencies planned in the RPP should be clear, concrete and easy to understand; (2) RPP must be simple and flexible; (3) RPP which is developed in a comprehensive, whole, and clear attainment; (4) should coordinate with the implementing components of school programs, so as not to interfere with other lessons [9]. LKPD is a learning tool as a complement or a means of supporting the implementation of RPP. The characteristics of LKPD are 1) Have all the instructions required by the student, 2) The written instructions are easy to understand[10]. The structure of LKPD generally consists of Title, learning guidance of competence to be achieved, supporting information, tasks and work steps, assessments[11]. In designing LKPD, teachers should know the things that must be considered in designing the development of LKPD is the suitability of materials, tasks and exercises with indicators of achievement of competence, so that the tools developed high quality. Learning tools developed should be validated with five experts who are competent in their field before being tested for trial.Trial done to know the practicality of learning tools. Practicality is known from trial results one-to-one, small group, andfield test[12]. The practicality of a teaching material can only be met if experts and practitioners state that what is developed is applicable. the tool is said to be practical if the tool can be applied in the field and the level of its implementation in the category of at least good. tools are

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also said to be practical if it gets a positive response from teachers and students[13].

## 2. RESEARCH METHODS

Type of research is research and development (Research and Development) using Plomp model. This model consists of three stages:preliminary research, prototyping phase, evaluation phase[14]. Preliminary research is a preliminary analysis stage. At this stage do an analysis of the needs of learning tools mathematics.The analysis is a requirement analysis, curriculum analysis of competence standard and basic competence on sequence and series material. The analysis also needs to be done is the analysis of students through interviews with some students of SMAN 1 BatangKapas to know the characteristics of students, so that learning tools produced in accordance with the characteristics expected by students. Prototyping phase Learning toolss are designed in accordance with the results of the analysis that has been done. The design produced at this stage is called prototype 1.In this design, formative evaluation is conducted for the purpose of improvements being developed [15]. Beginning with self-evaluation is self-evaluation conducted by researchers and one friend.The goal is to make corrections to the completeness of the components contained in the learning tools that has been developed. The results of self-evaluation were analyzed, and revised. Furthermore, will be tested the validity of prototype I learning tools based on mathematics discovery learning.Validation is a test of validity, accuracy, and the truth of things. The validation process is performed by an expert or expert in accordance with the field of study [16]. Validation conducted 5 experts who are competent in their field, including 3 lecturers of mathematics education, one lecturer of educational technology, and one lecturer of Indosias language. Comments and suggestions from the validator become references to the revision of prorotype I learning tools which is developed. Development process can be continued if prototype I declared valid. Evaluation continued through product testing. The evaluation of the mathematics learning tool consists of three stages: one-to-one evaluation, small group evaluation and large group evaluation. The instruments used were questionnaires and interview guidelines. The type of data is a data taken from the validation of mathematical learning tools conducted by the validator, the data of practicality by teachers and students. Data collection instruments used are preliminary research stage instruments, instruments of validity and practicality. Data analysis techniques used are descriptive statistics and qualitative data analysis.

## 3. RESEARCH RESULT AND DISCUSSION

### a. Research result

This research starts from the initial investigation stage, where at this stage done needs analysis, curriculum analysis, concept analysis and student analysis of mathematics learning tool that will be developed. Needs analysis results obtained conclusion that what is needed in implementing a learning is a learning tool for the learning process run systematically to achieve the desired goals.Learning tool needed is a lesson plan (RPP) and student worksheet (LKPD) that is able to direct students to find their own concept and build the problem solving ability of mathematics

students of class XII Senior High School on the material of sequence and series. So we need a math learning tool to improve students problem solving skills.The result of the curriculum analysis can be determined by the indicator of the sequence material and series of class XII Senior High School in the second semester. Analysis of SK and KD indicates that changes in order and merger of two basic competencies (KD) become one, this is done to adjust the interrelationship between each concept.The learning tool of mathematics is designed based on the results of the analysis in the initial investigative phase. At this stage, start making RPP and LKPD, using Microsoft Word 2010 applications and front cover design using Adobe Photoshop. The RPP is designed using the Discovery Learning model, with the appropriate syntax. Learning activities are designed in accordance with the characteristics of the student area and serve as a simulation in the learning process. Examples of issues raised as problems in learning are taken from the uniqueness of the area in the know by all students. RPP designed using the Discovery learning model and contains the uniqueness of the area will increase the curiosity and motivation of students in learning mathematics. LKPD is compiled using the Discovery learning model in accordance with the pre-designed RPP. LKPD, based on Discovery learning, is created using Discovery learning syntax in its working steps. LKPD which begins by displaying issues related to daily life. By reading, understanding and observing the problem, students then identify the problem given. To solve the problem, students collect data and process data to obtain problem solving. After obtaining problem solving, students try to prove the truth of the solution obtained and deduce the material that has been studied. LKPD based Discovery learning has an interesting image according to the problem to be solved in finding the concept of the material being studied Mathematical learning tools that have been designed are formatively evaluated. The validation result of mathematics learning tool is in very valid category with value on each aspect that is assessed. Based on the data, it can be concluded that the mathematics learning tool, based on the learning model of Discovery learning, is in very valid category. One to one evaluation is done by asking three students to comment on the LKPD that has been designed. Students consist of one low, moderate and high-ability student. One to one evaluation is performed for each meeting on LKPD. Students through interviews are asked to comment on the LKPD that has been designed. Comments given by students are used as a reference to develop LKPD based discovery learning. The results of one to one analysis based on the results of interviews of low-ability students say "the writing on the problem 1 is wrong typing" and based on students capable of saying "In the sentence should be more clarified again so easy to understand the sentence should be more clarified so easily understood"whereas based on the high-ability students say "In the problem image 2 for the photo of the durian merchant is removed and the edges are less attractive. At the second meeting, one to one evaluation was conducted for each meeting at LKPD. Students through interviews are asked to comment on the LKPD that has been designed. Furthermore, at the third meeting the low-ability students said "in writing on problem number 2, typing has a lot of spaces that are not the same" and based on the capable students are saying "the sentence there is not parallel arrangement" while based on high-ability students say " does not match EYD ". While

LKPD IV meeting until LKPD VI meeting based on interviews there is no suggestion about LKPD image there are only some wrong typing.The results of the one to one test by students are shown in Table 1.

*Tabel 1.On to one test resul on LKPD*

| Mee ting | Sub variable Practicality | Score Practicality (%) | Criteria |
|---|---|---|---|
| I | Attractiveness | 72,22 | Practical |
| | Process Usage | 75 | Practical |
| | Ease of Use | 72,92 | Practical |
| | Times | 75 | Practical |
| II | Attractiveness | 75 | Practical |
| | Process Usage | 83,33 | Very Practical |
| | Ease of Use | 83,33 | SangatPraktis |
| | Times | 83,33 | Very Practical |
| III | Attractiveness | 86,11 | Very Practical |
| | Process Usage | 88,89 | Very Practical |
| | Ease of Use | 83,33 | SangatPraktis |
| | Times | 83,33 | Very Practical |
| IV | Attractiveness | 88,89 | Very Practical |
| | Process Usage | 88,89 | Very Practical |
| | Ease of Use | 85,42 | Very Practical |
| | Times | 83,33 | Very Practical |
| V | Attractiveness | 91,67 | Very Practical |
| | Process Usage | 94,44 | Very Practical |
| | Ease of Use | 91,67 | Very Practical |
| | Times | 91,67 | Very Practical |
| IV | Attractiveness | 94,44 | Very Practical |
| | Process Usage | 94,44 | Very Practical |
| | Ease of Use | 93,75 | Very Practical |
| | Times | 91,67 | Very Practical |
| | Average | 85,73 | Very Practical |

Subsequently, small group evaluations were performed. Small group evaluation is done after the evaluation is done one by one. Small group evaluation was conducted by 8 students. 2 high-skilled students, 4 medium-skilled students and 2 high-ability students. Students are given a questionnaire to assess the practicability of LKPD, which is based on Discovery learning. Practicality test results assessed by students in small groups of each statement are presented in Table 2.

*Table2. Small Group Test Results on LKPD*

| Mee ting | Sub variable Practicality | Score of Practicality (%) | Criteria |
|---|---|---|---|
| I | Attractiveness | 79,17 | Practical |
| | Process Usage | 81,25 | Very Practical |
| | Ease of Use | 80,47 | Very Practical |
| | Times | 68,75 | Practical |
| II | Attractiveness | 83,33 | Very Practical |
| | Process Usage | 85,00 | Very Practical |
| | Ease of Use | 86,72 | Very Practical |
| | Times | 71,88 | Practical |
| III | Attractiveness | 83,33 | Very Practical |
| | Process Usage | 85,42 | Very Practical |
| | Ease of Use | 86,72 | Very Practical |
| | Times | 75 | Practical |
| IV | Attractiveness | 89,58 | Very Practical |
| | Process Usage | 85,42 | Very Practical |
| | Ease of Use | 88,28 | Very Practical |
| | Times | 87,50 | Very Practical |
| V | Attractiveness | 89,58 | Very Practical |
| | Process Usage | 86,46 | Very Practical |
| | Ease of Use | 92,71 | Very Practical |
| | Times | 90,63 | Very Practical |
| IV | Attractiveness | 89,58 | Very Practical |
| | Process Usage | 90,63 | Very Practical |
| | Ease of Use | 95,31 | Very Practical |
| | Times | 90,63 | Very Practical |
| | Average | 82,53 | Very Practical |

Based on Table 2, it can be seen that LKPD practicality level in Very Practical category with value 82,53. The results of the small group revision were followed by field trials of the mathematics teacher and the XII grade 1 IPA 1 SMAN 1 Batang Kapas students to find out the teacher response and the student response. The teacher response test obtained information about the development of learning tools developed, and the student response test was conducted to determine the level of Practicalan of the developed LKPD [17]. The results of practicality test of teacher learning tool, each statement presented in Table 3.

*Table3. Field Test Results of Teachers' Learning Tools*

| Mee ting | Sub variable of Practicality | Score of Practicality (%) | Criteria |
|---|---|---|---|
| I | Attractiveness | 81,25 | veryPractical |
| | Process Usage | 75,00 | Practical |
| | Ease of Use | 81,25 | Very Practical |
| | Times | 75,00 | Practical |
| II | Attractiveness | 87,50 | Very Practical |
| | Process Usage | 75,00 | Very Practical |
| | Ease of Use | 81,25 | Very Practical |
| | Times | 75,00 | Practical |
| III | Attractiveness | 87,50 | Very Practical |
| | Process Usage | 75,00 | Very Practical |
| | Ease of Use | 87,50 | Very Practical |
| | Times | 87,50 | Very Practical |
| IV | Attractiveness | 87,50 | Very Practical |
| | Process Usage | 87,50 | Very Practical |
| | Ease of Use | 87,50 | Very Practical |
| | Times | 87,50 | Very Practical |
| V | Attractiveness | 87,50 | Very Practical |
| | Process Usage | 87,50 | Very Practical |
| | Ease of Use | 81,25 | Very Practical |
| | Times | 87,50 | Very Practical |
| VI | Attractiveness | 93,75 | Very Practical |
| | Process Usage | 87,50 | Very Practical |
| | Ease of Use | 87,50 | Very Practical |
| | Times | 100 | Very Practical |
| **Score of Practicality total** | | **84,89** | **Very Practical** |

Based on Table 3 shows that the practicality level of the learning tool in the category is very practical with the value of 84.89. The results of the large group practice test by students are shown in Table 4.

*Table 4.Practicality of Field Test of Learning Tools by Students*

| No | Sub variable Practicality | Score of Practicality (%) | Criteria |
|---|---|---|---|
| I | Attractiveness | 81,99 | Very Practical |
| | Process Usage | 83,33 | Very Practical |
| | Ease of Use | 78,63 | Practical |
| | Times | 76,61 | Practical |
| II | Attractiveness | 82,20 | VeryPractical |
| | Process Usage | 83,60 | Very Practical |
| | Ease of Use | 79,32 | Practical |
| | Times | 77,42 | Practical |
| III | Attractiveness | 82,26 | Very Practical |
| | Process Usage | 84,14 | Very Practical |
| | Ease of Use | 82,06 | Very Practical |
| | Times | 79,03 | Very Practical |
| IV | Attractiveness | 84,56 | Very Practical |
| | Process Usage | 84,67 | Very Practical |
| | Ease of Use | 84,27 | Very Practical |
| | Times | 79,03 | Practical |
| V | Attractiveness | 85,95 | Very Practical |
| | Process Usage | 85,22 | Very Practical |
| | Ease of Use | 84,67 | Very Practical |
| | Times | 79,03 | Practical |
| VI | Attractiveness | 86,56 | Very Practical |
| | Process Usage | 88,71 | Very Practical |
| | Ease of Use | 88,11 | Very Practical |
| | Times | 79,03 | Practical |

In addition, tested the implementation of learning tools. Implementation test of learning tool can be done by observing the implementation of the series of learning process presented in RPP[18]. The results of the implementation test of mathematical learning tools are shown in Table 5.

*Table 5.Observation Results of RPP Based Discovery learning by Teacher*

| Meeting | Score of RPP Implementation (%) | Criteria |
|---|---|---|
| I | 81,25 | Very Practical |
| II | 81,25 | Very Practical |
| III | 84,38 | Very Practical |
| IV | 85,94 | Very Practical |
| V | 85,94 | Very Practical |
| VI | 89,06 | Very Practical |
| Average | **84,64** | Very Practical |

Based on Table 5 it can be seen that the value of the implementation of the RPP, which is based on Discovery learning, in six meetings on the sequence material and each series gets the Very Practical criteria.

## b. Discussion

Based on the results of research that has been done, learning tools based on Discovery learning mathematics has met the valid, practical criteria.the tools to be tested for their practicality must be tested for validity first. Based on the validity test, learning tools (RPP and LKPD) are at very valid criteria. The practicality of LKPD is based on teacher's assessment, student's response and LKPD implementation done at product trial stage [19].The practice test is done by spreading questionnaire responses to students and teachers as well as interviews with students of class XII IPA 1 SMAN 1 BatangKapas. Student response is one of the parameters for knowing students' responses to the use of learning tools that have been developed and used in limited trials [20]. Respondents who filled the sheet of practicality consisted of 1 mathematics teacher SMAN 1 Batang Kapas and 31 students of class XII IPA 1 SMAN 1 Batang Kapas. Practicality test results on aspects of Attractiveness show the appearance of learning tools based on Discovery learning mathematics developed interesting to learn so that students are motivated to learn. Practicality test results on Process Usage aspects show that LKPD based Discovery learning that has used images that can assist students in understanding the problem. The use of discovery approaches can involve students in problem-solving activities, self-study, critical thinking, and understanding and creative learning[21]. Exercises are also able to assist students in developing the ability of mathematical communication and skills. In addition, the use of LKPD does not create a boring atmosphere. Discovery learning is where students learn to recognize imasalah, seek relevant information, build solutions of problems [22]. Problems equipped with pictures can help students understand the situation and solve problems. Through the problem will increase students' curiosity. Learning tool of science-based Discovery learning model can facilitate students in developing the character of curiosity and creative thinking skill of students on classroom in topic solid figure of mathematics grade XI [22]. Discovery learning allows students to take examples from everyday life, to

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propose hypotheses, test them like scientists in order to improve the level of cognitive ability[23]. Discovery learning refers to a process whereby students discover an existing knowledge in the student itself through the learning process[24]. Learning using Discovery learning not only improves student learning, but also lowers their chances of leaving the learning process at an early stage[25]. Many teachers also recognize the potential of Discovery learning and in principle positively add this teaching approach to their repertoire[26]. Learning using Discovery learning can make learning more meaningful for students to understand the material being studied with the ability and relevance of the information it has [27]. Through Discovery learning students have the ability to monitor the processes they have learned to pay attention to what already exists [28]. Practicality test results for the convenience aspects show that the problem solving steps contained in LKPD can be understood because it uses simple language.In addition, the problems presented in accordance with the order of the material being studied.The pictures presented are clear and in accordance with the issues raised. Learning tools based on discovery learning allows students to be directed through questions. Teachers who implement Discovery learning must provide questions, problems and puzzling situations in which they must all be solved and encourage students to use intuition [29]. In terms of time, mathematics learning tools are considered very practical by students. This indicates that the use of LKPD is sufficient and in accordance with the available time allocation.

## 4. CONCLUSION

Based on the results of the study, it was concluded that the learning tools based on Discovery learning mathematics which is developed very practical based on one to one evaluation, small group test and field test, and based on observation of RPP (lesson plan) implementation.

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