

Development of Based Student Worksheets Realistic Mathematics Learning Model For improvement of Critical Thinking Ability Class XI Vocational High School Students

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Abstract. This type of development research aims to determine the level of validity, effectiveness, and practicality of learning using Student Worksheets based on the Realistic Mathematics Learning model. This development uses the ADDIE development model that uses five stages: analysis, design, development, implementation, and Evaluation. The sample used is class XI SMK Private Mulia Medan. The results showed that the Student Worksheet, which was developed using the Realistic Mathematics Learning model, had a validity level of 4.6 with an outstanding category, the effectiveness level of the results of classical learning completeness in the first trial was 15% of the students completed while in the second trial. by 88% of students who completed. This shows an increase of 23% from the average critical thinking ability of students. Furthermore, the student response was very good with a percentage of 80%, and the practicality of the Student Worksheet obtained an average of 4.29 with a convenient category.

Keyword: Critical Thinking Ability, Student Worksheet, Realistic Mathematics Learning Model

Abstrak. Penelitian ini adalah jenis penelitian pengembangan yang bertujuan untuk mengetahui tingkat kevalidan, keefektifan dan kepraktisan dari pembelajaran dengan menggunakan Lembar Kerja Peserta Didik berbasis model Pembelajaran Matematika Realistik. Pengembangan ini menggunakan model pengembangan ADDIE yang menggunakan 5 tahapan yakni Analisis, Perancangan, Pengembangan, Implementasi, dan Evaluasi. Sampel yang digunakan adalah kelas XI SMK Swasta Mulia Medan. Hasil penelitian menunjukkan bahwa Lembar Kerja Peserta Didik yang dikembangkan dengan menggunakan model Pembelajaran Matematika Realistik mempunyai tingkat kevalidan sebesar 4,6 dengan kategori sangat baik, tingkat keefektifan dari hasil ketuntasan belajar klasikal pada uji coba I sebesar 15% peserta didik tuntas sedangkan pada uji coba II sebesar 88% peserta didik yang tuntas. Hal ini menunjukkan ada kenaikan sebesar 23% dari rata-rata kemampuan berpikir kritis peserta didik. Respon peserta didik sangat baik dengan

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persentase 80% dan kepraktisan Lembar Kerja Peserta Didik diperoleh rata-rata sebesar 4,29 dengan kategori sangat praktis.

Kata Kunci: *Kemampuan Berpikir Kritis, Lembar Kerja Peserta Didik, Model Pembelajaran Matematika Realistik*

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1 Introduction

The curriculum Education is training for an individual to improve his insight and skills in order to become a good citizen. According to [1] Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves, society, nation, and country. One of the fields of study in Indonesian education is Mathematics which is theoretical and abstract. This is what makes students feel that mathematics is a boring and difficult subject and students do not know and feel the benefits of mathematics itself.

Learning mathematics is not just memorizing formulas, but students must think critically about how to get answers according to concepts and steps. As stated by [2] in [3] in looking at critical thinking skills, it is suggested that there are activities to identify problems, explore information relationships, determine alternative priorities, and integrate strategies.

Realistic Mathematics learning provides opportunities for students to actively build their own understanding in learning mathematics. Teachers must be able to create the expected activities in learning Mathematics using realistic Mathematics Learning models so that whatever activities are carried out and undertaken by students will be meaningful and they will develop into formal students [4]. The fact found in the classroom is that the learning process carried out feels boring so that the material taught today will be forgotten at the next meeting. And the lack of student responses to answer questions in front of the class. For this reason, it is very appropriate to use realistic Mathematics-based learning models. Thus, teachers must be able to provide appropriate learning guidelines in the application of Realistic Mathematics Learning models and use clear stages so that they can bring up the potential for critical thinking of students.

The Student Worksheet (LKPD) is one of the teaching materials that can help students during learning. The use of LKPD in learning mathematics can encourage students to study teaching materials alone or together with their group friends. Therefore, an LKPD must contain learning that is in accordance with the characteristics of students and is able to make students feel meaningful learning and be able to think critically.

Based on the sample taken from 20 people, only 20% can solve the problem correctly. Most likely they do not understand the concept of the matrix, so that critical thinking skills in the class

are still relatively low according to the indicators put forward by [5] in [6] where people who think critically are able to identify problems into mathematical models and able to explore mathematical concepts, from . The answers given by students have not been able to determine alternative priorities and strategy integration in solving these problems.

Based on this description, the researcher views that to improve critical thinking skills, it is necessary to use learning media. For this reason, the author took the initiative to develop LKPD learning media in order to help improve students' critical thinking related to learning activities. In connection with the research title of the author's supervisor I, namely "Development of Ethnomathematical-Based Realistic Mathematics Learning Models to Improve Students' Critical Thinking Ability", the authors raised the title to be researched "Development of Student Worksheets Based on Realistic Mathematics Learning Models to Improve Critical Thinking Skills of Class Students XI SMK".

2 Related Work

Based on the background of the problem that has been described, the problems that who can identify are as follows:

1. The students' critical thinking level is relatively low.
2. The LKPD used has short and unattractive material.
3. Lessons are boring.
4. Students easily forget the material that has been taught.
5. Lack of student response to answer questions in front of the class.

The research objectives are:

1. To find out the level of validity of the LKPD that has been made.
2. To determine the level of effectiveness of the LKPD that has been made.
3. To find out the level of practicality of the LKPD that has been made.

3. Methodology

This study uses the ADDIE model's research and Development (R & R&D) method with the ADDIE model. Development research is research-oriented to developing and validating products used in education. The requirement to produce specific products is used study that is needs analysis and to test the effectiveness of development research is needed (Sugiyono, 2017: 422).

The development that will be carried out is the development of learning resources in the form of student worksheets (LKPD) based on the Realistic Mathematics Learning Model to improve students' critical thinking skills.

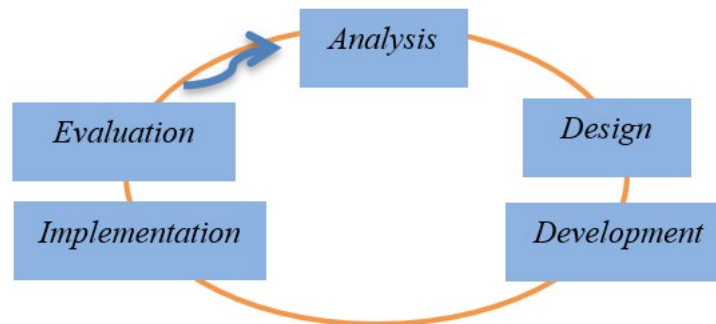


Figure 1: LKPD developed

The steps of development research in this study are described as follows:

1. Analysis (Analysis)

In this stage, an analysis of student needs, material analysis, and student characteristics is carried out.

1) Student Needs Analysis

In analyzing the needs of students, interviews were conducted with the mathematics teacher of class XI. The analysis results are: (1) The use of LKPD is less attractive, so students feel bored. (2) the use of LKPD used by students does not instil character values. (3) There are still many students who are less responsive in remembering and understanding the lessons delivered by the teacher. (4) Students need one of the teaching materials, namely LKPD, which is exciting and not dull.

2) Material Analysis

Material analysis is carried out to determine the needs of learning tools development. Students can analyze this material by looking at the curriculum used in the school that is used as a place of research. The material contained in the learning media that will be developed is by the competencies that students must master.

3) Analysis of Student Characteristics

Activities at this stage are to determine the students' initial abilities so that the development of LKPD is following their academic skills. Individual experiences strongly influence initial skills in interacting with their environment. Therefore, environmental differences may result in differences in initial skills. Differences in initial skills result in elaborating on new information to build cognitive structures.

2. Design

The design stage in developing LKPD is based on the Realistic Mathematics Learning Model, namely:

- a. Schedule: includes product design schedule, product analysis, data collection and product manufacture. The product's manufacture is scheduled to be completed before carrying out the research.
- b. Team: making LKPD products based on Realistic Mathematics Learning Model requires a work team with their respective tasks and roles consisting of: writers as product developers, expert teams to assess the resulting product, which consists of a group of media experts, a couple of material experts, and students as a respondent. The media expert Team is a lecturer and a vocational mathematics teacher. Meanwhile, the material expert team consisted of a mathematics lecturer and a vocational mathematics teacher. Product

specifications produced by LKPD writing, pictures and variations of writing colours help students understand LKPD made in book form.

3. Development

Development is the process of turning blueprints or designs into reality. The development stage in LKPD based on the Realistic Mathematics Learning Model includes several steps: the initial product, which media experts revised. After that, the product will be edited by material experts, and then the product is implemented for students.

4. Implementation

This implementation stage is where the product is tested to find out and collect data on the quality of LKPD based on Realistic Mathematics Learning Models to achieve reasonable, effective and practical mathematics learning objectives. The data is used to improve and refine the LKPD. The product trial in this study was in a small group trial. Product trials were conducted to see the feasibility of LKPD as teaching materials in mathematics learning. Tests were also carried out to see student responses to the results of LKPD development products developed through filling out questionnaires.

5. Evaluation

At this evaluation stage, several stages were carried out, namely evaluation by a team of material experts and a group of media experts through a product validation process; after the product was designed and developed, then the product was evaluated by a team of media experts and a team of material experts to get advice on the product. Evaluation is a process to see whether the learning system that is being built is successful by initial expectations or not. The evaluation aims to know the feasibility of a product (fit or not to be used in the learning process).

Data analysis aims to conclude the study's results, namely the analysis of mathematical critical thinking skills and LKPD analysis.

4. Result and Discussion

4.1 Result

This research is development research, namely the development of student worksheets (LKPD) based on realistic mathematics learning models to measure students' mathematical critical thinking skills in class XI SMK that meet valid, practical and effective criteria with the matrix material. After conducting the trial, the results of the validity, practicality and effectiveness of the LKPD and the effects of student observations can be seen. The explanation regarding this is as follows:

1) Validity

In this study, the developed worksheets were tested for content validity by two lecturers and two mathematics teachers.

2) Effectiveness

Learning effectiveness can be seen from several aspects, namely learning completeness, learning objectives, time and student responses. The following are the results of the student's critical thinking ability test. From Table 8. it will be seen the results of Trial I that have been carried out, where 17 students did not complete and as many as three students completed with an average value of 57.25.

3) Practicality

In this study, the LKPD developed was tested for practicality by students using a student response questionnaire using a Likert scale five. The questionnaire was validated by an expert lecturer in mathematics learning materials. As a result, 20 students become research respondents.

Based on Table 4.8, students can see that students' response to the practicality of using LKPD is indicated by the mean score of 4.29. Therefore, based on the practicality table, it is concluded that the LKPD developed is considered positive by students when used during the learning process at school.

4.2 Discussion

Based on the results of the research described in the previous discussion, the validity, practicality, and effectiveness of LKPD can be described as follows:

1. LKPD Validity

At this stage, the worksheets that have been developed are validated by material experts and media experts. The validation results are then analyzed and followed up according to comments and suggestions from material and media experts before being tested in schools. Comments and suggestions aim to improve the products that have been produced. Validation is carried out until the LKPD is finally declared feasible to be implemented in learning activities.

2. LKPD practicality

they distributed student worksheets based on the ethnomathematics of the Gordang Sambilan musical instrument that they developed can be seen in practicality from the results of student response questionnaires. Student response questionnaires at the last meeting. Students' responses to the expanded worksheets can be calculated using the formula: $\bar{X} = \frac{\sum X}{n}$, the results of student responses show that the products designed are practical with the percentage of students stating that they feel happy, interested, interested, understand, clear on the components and learning activities.

3. LKPD Effectiveness

Data on student learning outcomes were obtained by providing learning outcomes tests in the form of 3 (three) essay questions to 18 students of class XI IPA-1 SMA Primbana Medan. Based on the students' scores, there were around 15 students who completed from 18 students with a KKM score of 75.

5. Conclusion and Future Research

Based on the analysis in this study, it can be concluded that

1. The Student Worksheet (LKPD) developed with the Realistic Mathematics Learning model has met the valid criteria with an average of 4.6, which is included in the very good category.
2. The effectiveness of the LKPD is met with four indicators: The results of the critical thinking ability test given to students reached a very good category where 15 students completed with a percentage of 88%. The achievement of the learning objectives that have been formulated has reached more than 65% of each learning objective. Third, students' response in the learning process is in the very good category with an average of 4.29. Finally, the meeting time used in the learning process of the matrix material does not exceed the usual learning.
3. This LKPD is included in the very practical category.

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