

## RME-based Absolute Value Worksheet Design as an Effort to Improve Mathematical Thinking Ability of Tribhuwana Tunggal University Students

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### Abstract

The aim of this study was to produce a mathematics worksheet on absolute value material based on the Realistic Mathematical Education (RME) approach. The location of this research is Tribhuwana Tunggal University. The development model in this research is designed based on ADDIE, which includes: (A) analysis, which is about curriculum analysis and needs analysis; (D) design, containing the preparation of the worksheet; (D) development, intended in the process of developing an RME-based absolute value worksheet; (I) implementation, namely product testing conducted for small groups and for large groups with the aim of obtaining practical data and data on mathematical thinking skills; (E) evaluation, which is carried out in data analysis refers to the implementation stage. The results of product validation through a google form questionnaire conducted by media experts were 92%, material experts 87%, small group test 91%, large group test 88%, and students' mathematical thinking ability test results reached 83%. Based on these data, it shows that the designed worksheet is feasible and practical in improving the mathematical thinking skills of Tribhuwana Tunggal University students.

**Keywords:** Worksheet; RME; Mathematical Thinking Ability; Absolute value

### INTRODUCTION

Mathematics is an exact science that is both theoretical and abstract. It is not wrong if students feel bored, bored and have difficulty in learning mathematics. Tri Wijayanti (2011) states that mathematics is the science of quantity, shape, arrangement, and size, most importantly a method and process of finding precise concepts and consistent symbols, the nature and relationship between quantity and size, abstractly, pure mathematics or in terms of benefits in Applied mathematics. This is no exception also experienced by students of Tribhuwana Tunggal University, Mathematics Education Study Program who take the Mathematics Problem-Solving Strategy course. The main problem is when they learn about the Absolute Value problem. The mistake that happened to these students was that they mostly just memorized the formulas, but were not able to develop these

formulas further. If this is traced, the cause of the problem is that students lack the skills to think mathematically in answering problems conceptually and systematically. Thinking is a medium to get an understanding of a material, or in solving problems clearly (Setiawan, 2020).

Based on Mason (2010), mathematical thinking is a dynamic process to expand the scope and depth of mathematical understanding. The laziness of students to think further in solving mathematical problems, illustrates that students have low mathematical thinking skills. As a result, lecturers must try harder in understanding mathematical problem solving, especially absolute value material. The problem of absolute value is very vital in calculating the value of a function. One of these extra efforts is that the lecturer provides additional guidance to students in the form of a worksheet based on Realistic Mathematics Education (RME). According to Majid (2013) the use of worksheets can provide an increase in student learning activities, and can direct students more optimally in concept development. Based on this opinion, the use of worksheets will make students actively involved with the material being studied and make students' learning experiences more extensive in solving problems and students become more independent. This worksheet helps, the implementation of teaching and learning activities becomes more comfortable for students as well as for teachers. Students will be more active in mathematical thinking while lecturers will be more flexible in conveying material to students.

The worksheet design given by the researcher is a learning design that refers to a contextual learning approach in the form of a Realistic Mathematical Education (RME) approach. Based on the thoughts of Ningsih (2013), RME is an approach that emphasizes the teaching process conceptually and tends to produce active students. So it can be concluded that the concept of the RME approach is learning that is built from real contextual conditions based on student experience. The characteristics of RME are that students are more active in thinking, the context and teaching materials are directly related to the school environment and students, the teacher's role is more active in designing teaching materials and classroom activities (Wijaya, 2017). Therefore, the problem raised in this research is to develop a worksheet with an RME approach that is reliable, valid and practical and aims to maximize the mathematical thinking ability of Tribhuwana Tungadewi University students on absolute value material.

## **RESEARCH METHOD**

In this study using the type of research development (Research and Development). As we know, Research and Development is a research method carried out with the aim of producing certain products, as well as by testing the effectiveness of these products (Sugiyono, 2014). In addition, development research in education includes the type of research that aims to obtain products that support education and support learning by going through a needs analysis first, then undergoing product development, followed by evaluation and ending with revision and distributing the product. In this research, the product made is a worksheet for students based on the Realistic Mathematical Education Approach with the aim of improving the mathematical thinking skills of Tribhuwana Tungadewi University students. This research did not reach the deployment stage, due to limited time for implementation.

## Development style

In this study using the ADDIE model, Endang Mulyatiningsih (2012) describes the stages of ADDIE development design through five stages in sequence, which include the Analysis stage, Design stage, Development stage, Implementation, and Evaluation. (evaluation). The design of the ADDIE learning model is as follows.

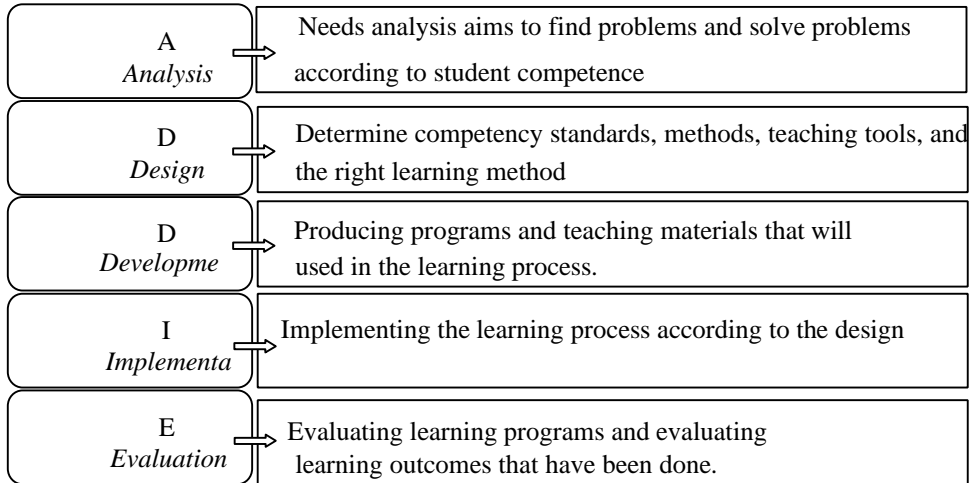


Figure 1. Stages of the ADDIE Model

## Development Procedure

Starting with the analysis phase, which includes curriculum analysis and needs analysis. Curriculum analysis aims to carry out a curriculum review in accordance with the subjects taught and think to make supporting teaching materials according to the material that is considered a problem, especially in improving critical thinking skills. The next stage is the design stage, namely the selection of worksheet designs, seeking reference input, identifying basic competencies and designing learning activities, identifying competency indicators and designing types of research that are suitable for the worksheet.

Entering the development stage, namely developing worksheets through the RME approach to improve students' mathematical thinking skills. This product was validated by several validators. The input from the validator serves as a reference for improving the development of the worksheet. When the validation phase is complete, the worksheet is tested on students. This worksheet was tested on a small group class of 5 students and a large group class of 20 students. Students use the product and are required to provide input through student response questionnaires. The last stage is evaluation, which aims to obtain information on the strengths and weaknesses of the worksheet that has been developed to be applied. This evaluation is carried out by analyzing the feasibility and practicality of developing worksheets that were developed at the implementation stage and further revisions during field trials.

## Data Collection and Data Analysis Techniques

The data collection technique aims to support evaluation activities and worksheet validation activities consisting of questionnaires and tests. Meanwhile, data analysis techniques were used to process the developed data which consisted of qualitative descriptive analysis and quantitative analysis. Qualitative descriptive analysis based on criticism, input, and suggestions for improvement in the questionnaire. While quantitative analysis of data processing by systematically compiling data in the form of percentage numbers about the object under study, before drawing general conclusions. The presentation of the analysis of the results of the worksheet validity test is based on scoring answers according to the instrument with several criteria, namely: 5 (Very Good), 4 (Good), 3 (Good Enough), 2 (Poor Good), and 1 (Not Good); the percentage assessment is obtained through the formula:

$$\text{validity} = \frac{\text{score}}{\text{maximum score that can be obtained}} \times 100\%$$

Furthermore, the data is interpreted according to the following provisions:

**Table 1. Interpretation of Data Validity worksheet based on RME Approach**

No	Interval	Criteria
1	81% – 100%	Very Valid
2	61% – 80%	Valid
3	41% – 60%	Quite Valid
4	21% – 40%	Less Valid
5	0% – 20%	Invalid

Source: Riduwan (2012)

Meanwhile, the percentage of mathematical thinking ability is as follows:

**Table 2. General Criteria for Qualifying Students' Mathematical Ability**

No	Interval	Criteria
1	81% – 100%	High
2	61% – 79%	Medium
3	<60%	Low

Source: Riduwan (2012)

## RESULTS AND DISCUSSION

Starting with the analysis stage, which includes curriculum analysis and needs analysis. The results obtained from the curriculum analysis and analysis of student needs are to produce worksheets with an RME approach that play a role in constructing knowledge independently and obtaining meaningful learning. The next stage is the design stage which contains the cover design, introduction, table of contents, concept map, pattern of learning activities, and worksheet assessment instruments about absolute values.

The next step in the development stage is to develop a math worksheet on the absolute value material of the RME approach so that learning is more meaningful for students. After completion, the worksheet was validated by media experts and material

experts using a worksheet assessment questionnaire. The results of the validity by media experts are as follows:

**Table 4. Validity Results by Media Experts**

No.	Validity Assessment Indicator worksheet	Validity Value	Criteria
1	Presentation Technique	93%	Very Valid
2	The use of language in a worksheet	91%	Very Valid
3	Communicative and Interactive	94%	Very Valid
4	Worksheet view	90%	Very Valid
<b>Rata-rata</b>		92%	Very Valid

Based on table 4, the score for the worksheet assessment by media experts is 92% with very valid criteria, so the worksheet is feasible to be applied. Furthermore, the results of the validity by material experts:

**Table 5. Validity Results by Experts**

No.	Validity Assessment Indicator worksheet	Validity Value	Criteria
1	Material suitability with SK and KD	92%	Very Valid
2	Material Update	88%	Very Valid
3	Ease of digested material	86%	Very Valid
4	RME Characteristics	84%	Very Valid
5	Language Aspect	90%	Very Valid
6	Time Allocation	82%	Valid
<b>Average</b>		87%	Very Valid

According to the description of table 5, the worksheet assessment score by material experts is 87% with very valid criteria. So that the overall assessment can be shown in table 6 as follows:

**Table 6. Validity Results In Overall**

No.	Validity Assessment Indicator worksheet	Validity Value	Criteria
1	Media Expert	92%	Very Valid
2	Material Expert	87%	Very Valid
<b>Average</b>		89,5%	Very Valid

Based on table 6 the assessment of the worksheet by media experts and material experts is an average of 89.5% with very valid criteria. The conclusion obtained is that according to media experts and material experts, the worksheet is valid. Furthermore, the worksheet was tested on two groups of students consisting of a small group and a large group. The following are the results of small group trials:

**Table 7. Results of Student Response Analysis of Small Groups**

No.	Practical Assessment Indicators worksheet	Value Practicalities	Criteria
1	Grain / structure	95%	Very Practical
2	Usage worksheet	89%	Very Practical
3	The material consistency	87%	Very Practical
4	Language	93%	Very Practical
	<b>Rata-rata</b>	91%	Very Practical

In table 7 respondents from the small group 91% said it was very practical. After that, the experiment was carried out on a large-scale group. The results of the large group trial are:

**Table 8. Results of Large Group Student Response Analysis**

No.	Practical Assessment Indicators	Practical Value	Worksheet criteria
1	Grain / structure	90%	Very Practical
2	Usage worksheet	87%	Very Practical
3	The material consistency	85%	Very Practical
4	Language	89%	Very Practical
	<b>Average</b>	89%	Very Practical

Based on table 8, the results of the large group were 88% with very practical criteria. Students are given a posttest to work on questions with the aim of measuring mathematical thinking skills after applying the worksheets that have been developed. The effectiveness of the use of the worksheet is easily known through the comparison of the posttest results obtained by students by achieving a minimum score of B. The minimum B value for the Unitri Mathematics Education study program is 69. The results of the effectiveness of the mathematics worksheet using the RME approach are:

**Table 9. Display of the Effectiveness of Mathematics Worksheets through the RME Approach**

No	Number of Students	Interval	Criteria
1	17 person	$\geq 69$	Minimal B
2	3 person	$< 69$	Less than B
	Average (mathematical thinking ability)	83%	High

If you refer to table 9, information is obtained that 17 out of 20 students have achieved the minimum B score criteria in absolute value learning, while the value is greater than 69 with a percentage of 83% meaning that students have achieved mathematical thinking skills in the high category. The last step is evaluation to revise the developed worksheet. This is based on the assessment of the validator and student questionnaire.

## CONCLUSION

The RME-based worksheet design on absolute value material has improved mathematical thinking skills for students of the Mathematics Education Study Program, Tribhuwana Tunggal University.

## REFERENCES

- Arifendi, Rio, Setiawan, R. (2019). Upaya Peningkatan Penalaran Matematis Mahasiswa Universitas Tribhuwana Tunggal Melalui Pendekatan Contextual Teaching Learning (CTL). *Jurnal Prisma Matematika*, Vol. 1, No. 2: 55-59.
- Craft, A. (2003). The Limits of Creativity in Education: Dilemmas for Educator. *British Journal of Educational Studies*. Volume 51. No. 2 (Juni, 2003), 113-127.
- Hwang, W.-Y., dkk (2007). Multiple Representation Skills and Creativity Effects on Mathematical Problem Solving using a Multimedia Whiteboard System. *Educational Technology & Society*, Volume 10 (2), 191-212.
- Kemendikbud dan Kebudayaan. (2012). Kurikulum 2013. Jakarta: Kemendikbud.
- Moleong, L. (2009). *Metodologi Penelitian Kualitatif*. Bandung: PT. Remaja Rosdakarya.
- Majid, A. (2013). *Strategi Pembelajaran*. Bandung : PT Remaja Rosdakarya.
- Mason, J., L. Burton, & K. Stacey. (2010). *Thinking Mathematically*. Wokingham, UK: Addison Wesley.
- Ningsih, P. R. (2013). Penerapan Metode Realistic Mathematics Education (RME) Pada Pokok Bahasan Perbandingan Senilai dan Berbalik Nilai Di Kelas VII E SMP IPIEMS Surabaya. *Gamatika*, III(2), 177– 184.
- Pehkonen, Erkki. (2007). The State of Art in Mathematical Creativity. <http://www.fiz.karlsruhe.de/fiz/publications/zdm> ZDM Volum 29 (June 2007) Number 3. Electronic Edition ISSN 1615-679X.
- Riduwan. (2012). *Skala Pengukuran Variabel-variabel Penelitian*. Alfabeta: Bandung.
- Setiawan, R., & Mitasari, Z. (2020). Penerapan Scaffolding Sebagai Upaya Dalam Meningkatkan Level Berpikir Matematis Siswa Ditinjau Dari Taksonomi Solo. *MUST: Journal of Mathematics, Education, Science and Technology*, Vol. 5, No. 1, Juli 2020 Hal 68-79. <http://doi.org/10.30651/must.v5i1.4855>
- Shimada. (2007). *The Significance of an Open-Ended Approach*, Reston, The National Council of Teacher Mathematics.
- Silver. (2006). 'An Analysis of Arithmetic Problem Posing by Middle School Students', *Journal for Research in Mathematics Education*, vol. 27, no. 5, pp. 521-539.
- Sugiyono. (2014). *Metode Penelitian Pendidikan Kombinasi (Mixed Methods)*. Bandung: Al-Fabeta.
- Wijaya, E., & Irianti, N. (2017). Whole Brain Teaching sebagai Desain Pembelajaran Matematika yang Kreatif. *Must: Journal of Mathematics Education, Science, and Technology*, 2(2), 196–207.