

DEVELOPMENT OF TEACHING MATERIAL ASSOCIATION FOR REALISTIC MATHEMATIC EDUCATION AT ISLAMIC JUNIOR HIGH SCHOOL STATE MODEL OF JAMBI CITY, JAMBI PROVINCE

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Abstract

This study discussed about development of teaching material association for grade seven D of Islamic Junior High School State Model Jambi. This study aims to determine the development and quality of learning module based on Realistic Mathematic Education. The research design belongs to Research and Development (R&D) by using ADDIE's model (Analysis, Design, Development, Implementation and Evaluation). In collecting data, the researcher applied Moduls and give questionnaire, students's learning test result, and observation sheet. The results obtained, (1) Questionnaire result from material expert obtained average score 82,5, design expert obtained average score 80,5, language expert obtained average score 77,5, learning moduls was valid and guitable to use for learning in material associaton at grade seven D of Islamic Junior High School, (2) student learning outcomes after using the learning modules with the approach of Problem Based Learning increased, it was seen in 80% of students completed in learning, (3) students' responses toward learning modules was positive, it was seen by the average score results of practicalities moduls learning students' responses were 86,2, the students stated that learning modules was very practical, (4) from the data sheet of the students' observation activities gained average were 84,17 so that the students' observation sheets very effective. So it concluded that teaching material based on Realistic Mathematic Education that devoloped were valid, practical and effective to use as a good learning material.

Keywords: Teaching Material, Realistic Mathematic Education, Mathematics

1. Introduction

1.1. Preliminary

Mathematics has very prominent characteristics, namely concepts that are interrelated means to be able to master a new or certain concept, directly with the concept being studied. But we often find out student complaints about mathematics. The students always assume that mathematics is difficult and frightening. Aside from the students themselves, when the teacher delivers of material is less understandable by students. Most the teachers use lecturing method regardless

of how far the students understand the material presented. The teacher only pursues the material, so that the material quickly completes when approaching the Final School Examination.

Based on the preliminary observations of the writer at Islamic Junior High School State Model Jambi City, learning mathematics in this school was not much different from some other schools. Mathematics learning at Islamic Junior High School State Model Jambi City was still inseparable from using of printed teaching material, such as 2013 curriculum-based mathematics printed

books. However, some mathematics teachers at Islamic Junior High School State Model Jambi City, argued that the book was still less relevant to use, with the reason some of the material presented in the book used concepts that were still unfamiliar to students, so students were reluctant and less motivated to read, let alone learn about it.

The author tries to make printed teaching material in the form of Realistic Mathematic Education-based learning modules as useful input in improving learning at schools, so that students are motivated and interested in mathematics lessons. The modules based on Realistic Mathematic Education, compiled and developed in order to construct cognitive abilities and skills students, thus emphasizing students' academic development and skills. Based on the description above the author conducted a research study entitled "Development of Teaching Material Association for Realistic Mathematic Education (RME) for Islamic Junior High School State Model"

The formulations of the problems are as follow: (1) How is the condition of learning based on Realistic Mathematic Education (RME) for Islamic Junior High School State Model Jambi City? (2) How is the validity, practicality, effectiveness of the development of set teaching material based on Realistic Mathematic Education (RME) Islamic Junior High School State Model Jambi City? (3) How is the students' ability with Realistic Mathematic Education (RME) based on learning for Islamic Junior High School State Model Jambi City?

2. Development method

Research and development method is a research method used to produce certain products, and test the effectiveness of certain products. To be able to produce certain products, research is used in the form of needs analysis and to verify the effectiveness of the products. Sugiyono (2011: 407)

This research includes research and development. The research model used was ADDIE model who developed by Owens and Lee. This model as the name implies, consists of five main

stages, namely: (1) Analysis, (2) Design, (3) Development, (4) Implementation and (5) Evaluation. The five phases or stages in ADDIE model must be carried out systematically

3. Data analysis technique

Data analysis technique was carried out to obtain of instructional material association based on quality Realistic Mathematic Education that met the criteria for validity, practicality and effectiveness. The steps in analyzing the quality criteria for the module developed were as follows.

3.1. Validity

This validity test was conducted to determine the level of module validity using an instrument in the form of a questionnaire that must be filled by the respondent. To find out whether the module was valid or not, the author used the following categories.

Table 1: Validation Assessment Criteria

Score Range	Criteria
80-100	Very Valid
61-80	Valid
41-60	Fairly Valid
21-40	Less Valid
0-20	Invalid

The data obtained were described by data frequency analysis techniques with the formula:

$$\text{Validation Value} = ((\text{item score obtained}) / ((\text{maximum score}))) \times 100\%$$

3.2. Practicality

Practicality was done to see the practicality of module determined by the results of writing. Practicality was seen from the questionnaire that assessed by mathematics teacher and all students at grade seven D totaling 25 people. To see if the media was practical or not, the writer used the following categories:

The data obtained were described by data frequency analysis techniques with the formula:

$$\text{Practical level} = ((\text{item score obtained}) / ((\text{maximum score}))) \times 100\%$$

Table 2: Practicality Assessment Criteria

Score Range	Criteria
80-100	Very Practical
61-80	Practical
41-60	Fairly Practical
21-40	Less Practical
0-21	Unpractical

3.3. Module Effectiveness Analysis

Effectiveness of teaching material association based on Realistic Mathematic Education was seen from students learning outcomes and responses who had given by students for learning modules that had been used.

The steps were as follows.

- 1) Giving a score of answers to each item was obtained by each student.
- 2) Calculating the number of score was obtained by each student.
- 3) Calculating the value was obtained by each student.
- 4) Categorizing student scores based on Minimum Completeness Criteria value at school, which was 70.
- 5) Calculating the number of students who had achieved completeness of learning outcomes then calculates the percentage by the formula:

$$K = \frac{\text{item score obtained}}{\text{maximum score}} \times 100\%$$

Categorizing the percentage of student completeness based on the criteria for assessing academic skills.

Table 3: Effectiveness Assessment Criteria

Score Range	Completeness	Criteria
$K > 80$		Very High
$61 < K \leq 80$		High
$41 < N \leq 60$		Fairly
$21 < N \leq 40$		Low
$K \leq 20$		Very low

Percentage of students learning completeness shows the results of learning mathematics after doing mathematics learning activities by using teaching material association based on Realistic

Mathematic Education. Teaching material association based on Realistic Mathematic Education are said to be effective if the minimum completeness criteria are Fairly High.

4. Results of development and Discussion

4.1. Development Results

4.1.1. Analysis Phase

The analysis phase is the initial stage in designing the Module. At this stage there are several steps of activities, namely:

Needs analysis. Aims to raise the basic problems needed in development of the Module. The needs analysis had been carried out by researchers when described background of the problem. There were several things that were very important to be considered and became a basis for consideration to produce teaching material association based on Realistic Mathematic Education is Junior High School/ Islamic Junior High School which was available at school.

Student Characteristics Analysis. Activities at this stage are to find out how students' characteristics and students' initial knowledge. Because the products will be made for students in grade seven, then analyze students' characteristics in grade seven. This could be done by asking experienced class teachers to teach these students for example by asking students' character and students' mathematic scores.

Concept Analysis. This concept analysis was intended to identify, detail and systematically compile the main concepts of material association in mathematics subjects.

Curriculum Analysis. At the stage of curriculum analysis, it is useful to know the curriculum that applies in schools, basic competencies, indicators of learning, and knowing what material there are in mathematics that can be used as mathematics teaching material in the form of learning modules. So that at the design stage product, the structure or components of the teaching material are in accordance with the curriculum used. As for

the things that were done by gathering information from various sources about the curriculum used, and the mathematics lesson material that was the target of making instructional material in the form of learning modules namely association. Then material was grouped based on the basic competencies that would be studied in the material association. In addition to information about learning material, other information that must be collected was the syllabus and the basic association of competencies at grade seven of Islamic Junior High School as a reference for the author to make teaching material in the form of mathematics learning modules in accordance with the applicable curriculum.

4.1.2. Design Phase

The next stage is the design stage at the design stage, the researcher began designing the learning module in mathematics. The design phase includes several aspects, namely:

Design of the Mathematics Learning Module Cover. The author sought information from various related sources by making the cover of the Learning Module. Seeing from the sample cover of the book or sample cover of other existing learning modules, so that researchers could produce designs that look better and look attractive with a combination of learning modules / books before viewing content from the learning module / book.

The design of the contents of the learning module. In the contents' design of the selection and determination of material intended to meet one of the criteria that the learning module must be interesting so that it could help students to achieve competence. Learning modules were made according to the needs and compatibility with the basic competencies

that would be achieved by students. In this case the researcher chose the learning module. Unlike the Student Worksheets which were commonly used in schools, this learning module was packaged more interesting by giving variations in colors and images, easy to understand language usage that made students enthusiastic in reading

and learning. The design of the contents of the Learning Module includes:

Title

In the title design stage, it was seen based on basic competencies, indicators to be achieved, subject matter, and based on a strategy. This module was entitled "Teaching Material Association based on Realistic Mathematic Education". On the cover were pictures of various associations such as collection of fruit.

Module Usage Instructions

Instructions for using were presented to make it easier for students to use the learning module or in solving problems. In this learning module there were instructions using for students. The instructions for using the module provided are:

- a) The conditions for learning to use this module depend on your discipline and diligence in understanding and following the learning steps.
- b) Learning by using this module was done independently or in groups with your friends during class hours.
- c) The presentation of this module begins with an explanation with material descriptions were accompanied by pictures, examples, and exercises.
- d) Read and examine the presentation of contextual problems and work out the practice questions.
- e) If you were experiencing difficulties in studying this module, discuss it with your friends. But if you had not been able to solve the problem in your discussion, you could ask the teacher.
- f) After you feel you could understand the material by doing exercises on learning activities, you had the right to train yourself by working on the self-test available in the module so that you could measure yourself how far you were able to absorb the material in this module.
- g) The order of learning in the module learning activity was highly recommended to follow so you could successfully in studying this module.

4.1.3. Competencies to be achieved

In designing the competencies to be achieved, chose the basic competencies that would be

used in making the mathematics learning module based on Realistic Mathematic Education adjusted to the results obtained in the analysis phase. Based on the analysis phase, the basic competencies were obtained for completing contextual problems related to the association, sub-association, universes association, empty association, complement association, and binary operations on the association, as well as indicators of learning are explaining the association concept, explaining subsets, universes association, the empty association, the complement association, described the binary operations in the association and resolves the problems related to the association, sub-association, empty association, complement association, and performs binary operations on the association.

In designing basic competencies were made on one page with core competitors and indicators and then the basic material was structured systematically according to each basic competency. Then to make it easier to find or find the material to be studied, it was made in the table of contents.

4.1.4. Work Tasks or Steps in the Learning Module

This work step was made per sub-material, which the learning steps in each sub-material used a learning model based on Realistic Mathematic Education, such as:

Activity

In this step, students learned mathematics through doing activities, namely by working on problems specifically designed. Students were expected to be active in the learning process so that they were able to develop material given in the form of daily life forms.

Reality

The main purpose of this stage is so that students are able to apply learning to solve problems faced.

Understanding

In this step, students were asked to be able to develop the ability to find problems solution and their relationships.

Intertwinement

At this stage, students had the opportunity to

solve problems by applying various concepts, formulas, principles and understanding in an integrated and interrelated manner.

Interaction

Students were given the opportunity to share experiences, settlement strategies, or other findings. Interaction allows students to reflect which ultimately encouraged them to gain a higher understanding than before.

Guidance

Guidance was done through guided reinvention activities, was namely by giving the widest students opportunity to try to find their own principles, concepts, or mathematical formulas through learning activities specifically designed by the teacher.

Analyze

Providing opportunities with the teachers helping drew conclusions about the material based on the results of discussion. Providing reinforcement of material about the material had been studied.

Exercise

Individually, students work on questions which aimed to determine the level of achievement of competence from foreign students.

Assessment

Containing a competency test in which all material were integrated together to see overall whether students during the previous learning process had achieved the expected competencies.

4.1.5. Validation by Expert Team

At this stage, the Learning Module validation had been made through expert judgment to obtain data about the Learning Module product results. The author selected two lecturers from Islamic State University Sulthan Thaha Saifuddin Jambi who were considered experienced to assess the product as a team of experts or valuers. Validation was carried out by the expert team was material validation, design validation and language validation.

This validation was done by going directly to the experts to assess and validate the products was made by showing the design plan, the expert team was asked to assess the Learning Module so that it could further identify its weaknesses and

strengths. Validation results from experts in the form of suggestions or comments were used to revise the Learning Module that has been made.

Material Contents Validation of Mathematics Learning Module based on Realistic Mathematic Education

Based on the material validation, the writer chose Islamic State University Sulthan Thaha Saifuddin Jambi lecturer as a material expert valuator, Abul Walid, M. Pd, to assess the material from the Learning Module. After the expert saw the Learning Module that the author made, then the valuator assessed the questionnaire by using expert material questionnaire.

Based on assessment of the questionnaire, the score was obtained by the material expert team on the Mathematics Learning Module based on Realistic Mathematic Education was 33 and the average score of assessment by the material expert team on the Mathematics Learning Module based on Realistic Mathematic Education was 82,5. From the score category 80-100, the average result is obtained that the assessment by the material expert team on the Mathematical Learning Module based on Realistic Mathematic Education is "Very Valid". But there are a few suggestions and comments for improvements for material in the Mathematics learning module based on Realistic Mathematic Education, namely (1) mathematical symbols adjusted to the symbols on the computer, (2) the material was not too long, just points, (3) Example problems and alternative solutions were adjusted. Based on suggestions and comments the Module needs to be revised.

Content Design Validation of Mathematics Learning Module based on Realistic Mathematic Education

In this design validation, the writer chose Islamic State University Sulthan Thaha Saifuddin Jambi lecturer, namely Marni Zulyanti, M. Pd, to assess the design of Mathematics Learning Module based on Realistic Mathematic Education. After the expert team looked at the Mathematics Learning Module based on Realistic Mathematic Education who writer designed, then the evaluator assessed the questionnaire by using a design expert assessment questionnaire.

Based on the questionnaire assessment, the number of assessments by the design expert team in the Mathematics Learning Module based on Realistic Mathematic Education was 29 and the average score of assessment by the design expert team in the Mathematics Learning Module based on Realistic Mathematic Education was 80,5. From the score category 80-100, the score is obtained that the assessment by the design expert team in the Mathematics Learning Module based on Realistic Mathematic Education is "Very Valid". But there are a few comments and suggestions for improvements to the design of the Mathematics Learning Module based on Realistic Mathematic Education, namely (1) Cover Modules adapted to the material were more attractive by adding pictures, (2) Giving colors to Venn diagram to be more interesting, (3) Describe each picture. Based on suggestions and comments the Mathematics Learning Module based on Realistic Mathematic Education was needed to be revised.

Language Mathematics Learning Module validation based on Realistic Mathematic Education

In this language validation, the writer chose Islamic State University Sulthan Thaha Saifuddin Jambi lecturer, Mrs. Marni Zulyanti, M.Pd, to assess the language of the Mathematics Learning Module based on Realistic Mathematic Education. After the expert team looked at the Mathematics Learning Module based on Realistic Mathematic Education that the design writer, then the valuator assessed the questionnaire by using an expert language questionnaire instrument.

Based on the of the questionnaire assessment by the team of language experts, the total score of the Mathematics Learning Education based on Realistic Mathematic Education was 31 and the average score of assessment by the material expert team in the Mathematics Learning Module based on Realistic Mathematic Education was 77,5. From the score category 61-80, the average result is obtained that assessment by the material expert team on the Mathematics Learning Module based on Realistic Mathematic Education is "Valid". But there are a few suggestions and comments for improvements to material in the Mathe-

matics learning Module based on Realistic Mathematic Education namely adjusting the writing with Enhanced Spelling. Based on suggestions and comments the Module was needed to be revised.

One one-to-one trial Analysis

This individual product trial was conducted on one mathematics teacher who taught at the Islamic Junior High School State Model in Jambi City Mrs. Rosnelly, S.Pd. Teachers was asked to observe and assess learning modules using a questionnaire consisting of several questions.

Based on the questionnaire assessment, the number of teacher practicality questionnaire scores in learning modules based on Realistic Mathematic Education in the Islamic Junior High School State Model in Jambi City was 51 and the average score of the product trial teachers responses to the learning module based on Realistic Mathematic Education was 91. From the score category 80-100, the average result is obtained that the evaluation of the teacher practicality questionnaire in the learning module based on Realistic Mathematic Education of the Islamic Junior High School State Model in Jambi City is "Very Practical".

Based on the respondents' assessment, it can be concluded that the teacher's response to the learning module makes a positive response, so that this learning module can be said to be feasible and good.

Mathematics Learning Module Trial

After a product trial from a mathematics teacher, then the researcher asked for a response from Grade seven D of Islamic Junior High School State Model in Jambi City. In this trial, it was done by all students of grade seven D were conducted, totaling 25 students.

This product trial took a place for approximately 2 hours of lessons by giving an overview of the material, student activities, and exercises in the learning module. After being tested, the author asked the students to give an assessment in the form of student responses by using a questionnaire consisting of 14 questions.

Based on the questionnaire assessment, students' response questionnaire scores were ob-

tained regarding student responses to the learning module based on Realistic Mathematic Education. The Islamic Junior High School State Model in Jambi City was 1207 with the total score of criterion (N) was 86.21 from the $80 \leq N \leq 100$ category categorized as "Very Practical ". Based on the respondents' assessment, it can be concluded that students' responses to the Realistic Mathematic Education based on learning module are feasible to use in mathematics learning.

Sheet Observing Student activities Data Analysis

Observations carried out in 4 meetings and observation sheets consisted of 6 assessment aspects that refer to learning. At the time of the observation activity, the author was assisted by one mathematics teacher at Islamic Junior High School State Model in Jambi City Laboratory namely Ms. Rosnelly, S. Pd and a mathematics student, Auliya Azka Mukhtar, to observe 25 students.

From the results of observations during the learning activities took place, was obtained from each aspect of the indicator, namely: Paying attention to the teacher's explanation (80,25%), answering the questions of the teacher and classmates (80,5%), asking the teacher and friends (81,25 %), working on individual and group assignments (75,8%), presenting and responding to work on the material (79,5%), and recording learning material and making conclusions (83,0%).

Student Learning Results Test Data Analysis (post-test)

In the implementation stage, the author applied for using set that the mathematics learning module was based on Realistic Mathematic Education in the actual situation at grade seven D. The implementation was done in 4 meetings outside the post-test. After all the material was delivered, a post-test was held to find out student learning outcomes. The student worksheet device could be said to be useful and effective if the student learning outcomes met the Minimum Completeness Criteria 70 and more or the same achieve class completeness requirement with 70% of students complete.

In the implementation of post-test was at-

tended by 25 students. From the results of post-test, the calculation of average value and the percentage of students who met the Minimum Completeness Criteria were calculated. The value of post-test results at grade seven D students, the number of students who had not been completed were 5 students with percentage 20% and the number of students who complete were 20 students with percentage 80% completeness. From the calculation results, it appeared that in grade seven D the percentage of students who were completed with Minimum Completeness Criteria 70 were 20 students and reached the class completeness requirement that was 70% of students reached the Minimum Completeness Criteria.

5. Discussion

5.1. Results of the Development of Mathematics Learning Module based on Realistic Mathematic Education

After going through the development process, the stages included: first the author designed a mathematics learning module based on Realistic Mathematic Education in mathematics subjects, especially association. In the discussion of the entire association of material in the learning module students could more easily understand because the way students though had been directed for description of the material that was done by using the steps of the Realistic Mathematic Education approach. The mathematics learning module Realistic Mathematic Education was equipped with basic competencies and achievement indicators competencies which had been mentioned in the introduction to the learning module, then at the end of the learning module also prepared questions that covered the entire material discussed.

After completing designed learning module, the learning module was validated with material experts, design experts and language experts. According to Emzir (2011: 273), validation is a product design assessment process carried out by giving an assessment based on rational thinking, without field trials. The results of the average validation in the learning module material from

the three expert teams was 81 stated that Realistic Mathematic Education learning module was accordance with the learning of mathematics, the accuracy for using of terms was according to science, the topic of material in this teaching material was clearly stated, the material presented complete, the order of material in the learning module was structured systematically, the learning module had examples of questions to improve students' understanding, feedback on practice questions that were in effective learning modules and in accordance with main competency, basic competency and indicators and mathematical symbols could be clearly understood by students.

Based on the design expert's assessment about the designing of Realistic Mathematic Education learning module, the average validation score of 80,5 states that the Realistic Mathematic Education learning module in mathematics learning is a creative development and innovative teaching material, the presentation of an interesting learning module can motivate students and encourage students are actively involved in the teaching and learning process, can facilitate students to learn independently. So it can be concluded that the assessment of material and the design of learning modules that are validated by experts are categorized as good and feasible to be tested in the field with little revision.

After the design and material of the learning module were revised, the author conducted a trial for 1 teacher and 1 grade seven D. This was in line with Emzir's (2011: 273) opinion, to see the effectiveness of the instructional material is developed by asking respondents' opinions. After testing the product of the learning module on the teacher, the assessment results were 91, stating that the presentation of Realistic Mathematic Education based learning module was in accordance with the students' level of thinking and the language contained in the learning module was good and effective. For the students' trials, it was found that the average score of the product test on student responses was 86,21. From the two assessments the responses were obtained on average 89,8 with the category "Very Practical".

The next stage after it was revised the author

conducted trial to use it at grade seven D students of Islamic Junior High School State Model in Jambi City. In using trial, it was obtained observations from the observations made by the teacher with category "Very Effective" or with a percentage 84,17, it was seen from the results of student learning through post-test trials there were 80% of students who had reached the Minimum Completeness Criteria.

The learning module indicator is said to be valid if the learning module has been validated by a team of experts who are competent in their field, the learning module is said to be practically illustrated from the results obtained from the validator with little or no revision so that the learning module can be used by students in learning, while the learning module is said to be effective if the learning module meet the indicators of learning students' outcomes who have achieved completeness and the positive response of students was shown from the questionnaire is given during trial for using the learning module.

5.2. Effectiveness of Learning Modules based on Realistic Mathematic Education Towards Students Learning Activities and Outcomes in teaching and learning activities

Learning modules that had been categorized as valid, then tested on subject of the researcher, namely grade seven D students Islamic Junior High School State Model in Jambi City Model Jambi, the odd semester of academic year 2017/2018 who attend the teaching and learning process as many as 25 students was given learning as much as Realistic Mathematic Education. This trial was done five meetings. In teaching and learning activities, students used the Realistic Mathematic Education learning module for association material where the students were active in learning while teachers were only as facilitators and only direct students in learning. To find out the activeness of students participation in learning by using the learning module, observations were held. Observations were made by mathematics teachers by filling out the observation sheets provided.

After giving the material association was complete, then post-test was carried out. Based on the results of the post-test, there were 20 students who achieved the standard in answering the question. In Figure 4.4, the results of highest and lowest students' answers were shown. The students whose grades were very low, they were 45 under the Minimum Completeness Criteria. The percentage of students who reached Minimum Completeness Criteria 70 was 80% reaching the class completeness requirement; it was 70% of students achieve Minimum Completeness Criteria.

Therefore, based on the above description, it can be concluded that the Realistic Mathematic Education learning module in the material association has been developed already effective to be used, it's seen from the percentage of students achieving Minimum Completeness Criteria and analysis of student activity observation sheets.

6. Conclusions and Recommendations

6.1. Conclusion

Based on the results of research on the Mathematical Learning Module development based on Realistic Mathematic Education (RME) conducted at grade seven D students Islamic Junior High School State Model in Jambi City Model Jambi, the validation of expert team are obtained an average of 81 of the average results obtained that the validation of expert team on the Mathematics Learning Module based on Realistic Mathematic Education (RME) this is "Very Valid".

Based on the results of teacher response trial questionnaires are obtained an average of 91 then the average results are obtained that the results of trial questionnaire of the mathematics teacher responses are "Very Practical". Furthermore, the results of student response questionnaires are obtained an average of 86.21, from the average results are obtained that the student response questionnaires "Very Practical". From the data observation sheet students' activities are obtained on average 84.17 so that the observation sheets of students' activities are "Very Effective".

6.2. Recommendation

The availability of effective learning modules can help the learning process and learning outcomes. The author advised mathematics teachers to use mathematics learning modules based on Realistic Mathematic Education on material association when teaching learning process, because based on the results of study, students learning outcomes by using mathematics learning modules based on Realistic Mathematic Education increased as evidenced by the achievement of Minimum Completeness Criteria and received positive responses from students.

It is needed development and research that should be carried out on the mathematics learning module based on Realistic Mathematic Education by applying it to different subjects.

It is necessary to develop more innovative learning media in other subjects so that students can develop various activities and creativity in learning.

[1–10]

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