Development of mathematics literacy problems based Bentenans textile for Junior High School Students

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Abstract. This study aims to produce mathematics literacy problems based on the values of local wisdom in North Sulawesi Province, namely bentenan’s textile that are valid and practical. The research method used is development research which consists of the stage of Analysis (needs analysis, curriculum, student’s character), Design, Development, Implementation, Evaluation. The subjects of this study were VIII grade students of SMP Negeri 4 Tondano. The results of the study were valid and practical mathematics literacy problems based on bentenan’s textile. The validity is known from the results of the validator's assessment on the validation sheet which states that the questions developed are good based on the assessment of content, construct and language and practicality is known from the results of individual and small group trial results which show that all students can use mathematics literacy problems based bentenan’s textile well.

1. Introduction
The Mathematical Literacy Contest which was held in North Sulawesi in 2015 showed that the winners of the contest were schools in urban areas [1]. Schools in rural areas find it difficult to be in the top rank, the cause is that students do not understand how to solve problems related to everyday life that are related to mathematics, where the literacy problems given relate to the real context around students.

Ojose argues that mathematical literacy is knowledge to know and use basic mathematics in everyday life [2]. In this sense, someone who has good mathematical literacy skills has a sensitivity to which mathematical concepts are relevant to the phenomenon or problem at hand.

Based on the researcher interview with one of the teachers who was at SMP 4 Tondano, it was stated that the 2013 curriculum demands that students be able to solve the problems they encounter in everyday life. But in fact the students do not understand enough to solve problems related to everyday life in this case math problems, some students prefer to play with their smartphones which are not used to find more information for learning. The use of the context of the questions given by the teacher has no relation to the real context or what they encounter on a daily basis, in this case, especially the questions using the context of local wisdom around students.

The use of local contexts can help students understand mathematical phenomena from the perspective of their own life experiences. In this regard, the questions related to students’ daily lives will be very interesting to activate students in learning.

One of the efforts that can be made to incorporate the values of local wisdom is by designing, making and developing math problems based on local wisdom values that exist in North Sulawesi Province, namely bentenan’s textile. Bentenan’s textile is a work of batik art inherited from the ancestors of North
Sulawesi which is traditionally woven with motifs depicting stories and cultural life in ancient times. The bentenan’s textile has seven motifs, namely tonilama, sinoi, pinatican, tinompak kuda, tinoton mata, kaiwu patola and kokera. The bentenan’s textile motif that will be used in this study is the pinatic or woven motif with mesh motif lines and hexagon shapes, the selection of the bentenan’s textile with the pinatic motif contains patterns that are mathematically very interesting because it contains geometric elements such as square and faceted shapes. Six. The pinatic motif bentenan’s textile is also used as student school uniforms, for this reason researchers are interested in stating questions that are closely related to concrete things around students by studying the making of questions using the bentenan context with pinatic motifs. With this research, it is expected that student’s literacy skills can improve.

2. Methods
The research method used is ADDIE development research [3]. In this study, it consists of the Analysis, Design, Development, Implementation, Evaluation stages.

The following is an explanation of the ADDIE development stage that the researchers will do.

2.1. Analysis
The analysis stage is the stage where the researcher analyzes the need for question development and analyzes the feasibility and development requirements. The stages of the analysis carried out by the author include three things, namely needs analysis, curriculum analysis, and character analysis of students. Broadly speaking, the stages of analysis carried out by the author are as follows.

2.1.1. Needs analysis. Needs analysis is done by first analyzing the questions used in learning as the main information and the availability of questions that support the implementation of a lesson. At this stage, questions will be determined that need to be developed to help students learn.

2.1.2. Curriculum analysis. The curriculum analysis is carried out by paying attention to the characteristics of the curriculum that is being used in a school. This is done so that the development carried out can match the demands of the applicable curriculum. Then the researcher examines the basic competencies to formulate indicators of learning achievement.

2.1.3. Student character analysis. This analysis was conducted to see the attitudes of students towards learning mathematics. This is done so that the development carried out is in accordance with the character of the students.

2.2. Design
The second stage of the ADDIE model is the design stage. At this stage, problems are designed to be developed according to the results of the previous analysis. At this stage, problems are designed to be developed according to the results of the previous analysis. Then the problems are made according to the format of the problems that have been determined. The results of this stage are called Draft 1.

2.3. Development
The development stage is the product realization stage. At this stage the question development is carried out according to the design. After that, Draft 1 will be validated by expert lecturers and subject teachers. Validation is carried out to assess the content and construct validity. Validators are asked to provide an assessment of the problems developed based on the item feasibility aspects of the problems and provide suggestions and comments related to the content of the problems which will later be used as a benchmark for revision of revisions and improvements to the questions. Validation is carried out until in the end the questions are declared feasible to be implemented in learning activities. At this stage, the researcher also analyzes the data on the results of the question assessment obtained from the validator. This is done to get the validity value of the questions. The result of this stage is called Draft 2.
2.4. **Implementation**

The fourth stage is implementation. The implementation stage of this research was carried out by directly testing Draft 2. The trial stage by individual groups, small groups, large groups. The results of this trial are used as a basis for carrying out the evaluation phase.

2.5. **Evaluation**

At this stage, the researcher made the final revision of the questions developed based on the input obtained from the response questionnaire. This is intended so that the questions developed are truly appropriate and can be used by a wider school. The result of this stage is the final draft.

3. **Results and discussion**

After conducting the research in accordance with the ADDIE model research procedure, the results of the research are described as follows:

3.1. **Analysis**

Before carrying out the development of mathematical literacy problems, the first step the researchers took was analysis. At this stage of the analysis carried out is a needs analysis, curriculum analysis, and character analysis of students.

3.1.1. **Needs analysis.** At this stage the researcher conducted interviews with the math teacher and analyzed the questions used in school learning, namely SMP Negeri 4 Tondano. The interview with the resource person, Mr. JRR. Based on the interview, it was found that the questions used in the school were still using what was written in the book so they still seemed ordinary. And at the time of the interview, the researcher gave an idea about the development of mathematics literacy problems based on bentenan’s textile and the responses given by JRR teachers were very supportive of the existence of these bentenan-based mathematical literacy questions, according to the JRR teacher this was an interesting innovation where the questions contained culture local can facilitate students' understanding because of its contextual nature, on the other hand it popularizes local culture in North Sulawesi, and problems that contain local culture have not been applied in these schools. So as stated by the JRR teacher, the questions used in these schools were still ordinary, so the JRR teacher gave an idea so that the questions developed were made as interesting as possible, it was clear so that students could understand the meaning of the problems. Based on what was found in the field, it is necessary to develop mathematics literacy problems based on bentenan fabrics that can facilitate students' understanding and also popularize local culture.

3.1.2. **Curriculum analysis.** At this stage the researchers analyzed the applicable curriculum at SMP Negeri 4 Tondano. This analysis aims to formulate indicators and learning objectives based on the core competencies and basic competencies that apply in SMP Negeri 4 Tondano. Based on interviews with JRR teachers, it is known that SMP Negeri 4 Tondano in the 2016/2017 school year started using the 2013 curriculum. Based on this curriculum analysis, it was found that the material to be used was in accordance with the 2013 curriculum material, namely for class VII and grade VIII mathematics subjects with Quadrilateral and Number Patterns.

3.1.3. **Student character analysis.** This student analysis is focused on grade VIII students as trial subjects, because grade VIII students have received quadrilateral and number patterns, the focus is more on grade VIII-A students who are test subjects based on suggestions from mathematics teachers in SMP Negeri 4 Tondano.

3.2. **Design**

In the second stage in this research is designing or designing questions. After the curriculum analysis stage has obtained the material to be used, the researcher designs or designs the bentenan-based mathematics literacy test questions, the criteria for the answer to the test questions and the scoring rubric.
The questions that the researcher designed were based on the previously analyzed material, namely the rectangular material and the number pattern.

The problems that are designed are problems that contain local culture, namely bentenan’s textile which are contextual, the appearance of the problems that are designed is made and designed as attractive and good as possible so that when students work on math literacy problems it can increase students' understanding of the material. Researchers also made question answer criteria and scoring rubrics aimed at making it easier for researchers, other researchers, and teachers to assess the results of tests that students had done. The result of this stage is called Draft I.

3.3. Development

In the third stage of this research is the development where in the previous stage the design was carried out and produced Draft I, Draft I would produce a revised Draft II based on suggestions and input from experts. The assessment from the experts was used as the basis for revising and refining Draft I. Validation of the questions was carried out by providing validation sheets to the validators consisting of two mathematics lecturers at Manado State University and two mathematics teachers at SMP Negeri 4 Tondano. After being revised, Draft 2 was produced.

3.4. Implementation

At this stage Draft II was tested on individual groups, namely 3 class VIII students of SMP Negeri 4 Tondano who had high, medium and low abilities. After Draft 2 was tested on individual groups, the researcher asked three students for comments to be used as a reference for input on the draft questions being developed. Based on the validation of the experts and the individual group stage, Draft 2 was revised, after being revised it produced Draft 3. After Draft 3 was made, it was then tried out in small groups consisting of six class VIII students of SMP Negeri 4 Tondano who had the ability level, namely two high-ability students, two medium-capable students and two low-ability students. The test questions that have been developed are to determine the legibility of the bentenan-based math literacy problems that have been made. After that it was revised and produced Draft 4 which was tested in large groups, namely 32 students of class VIII-A.

3.5. Evaluation

At this stage, an evaluation is carried out for the purpose of knowing the practicality of the questions being developed. The draft problems produced in this study are mathematics literacy problems based on bentenan’s textile. There are five problems developed with learning materials for number and quadrilateral patterns. Following are some discussion of answers from students. The purpose of the writer for the questions developed is so that students can better understand the things around students that are closely related to mathematics. The following is a display of one of the problems made by researchers based on bentenan's textile. The problems developed aim to activate student’s ability to use mathematical concepts in various contexts. Some of the problems developed in Figure 1 and Figure 2.
5. Problem given to determine the length of the sides, the size of the corners and the length of the diagonals. The following is presented in Figure 3 which is the reasoning for the students' answers in answering these problems.
Based on the analysis of student’s answers, it can be seen that students are able to solve problems based on the bentenan’s textile. And it can also be seen that this developed problem of mathematics literacy based on bentenan’s textile for junior high school students can explore students’ ability to solve math problems with contextual problems, in this case bentenan’s textile.

4. Conclusion
This study produced mathematics literacy problems based on bentenan’s textile that were developed which were categorized as valid. And it is suggested that teachers can use mathematics literacy problems based on bentenan’s textile to improve student’s literacy skills.

References
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