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THE DEVELOPMENT OF LEARNING DEVICES WITH THE RME ETNOMATHEMATICS-BASED APPROACH TO IMPROVE STUDENTS' UNDERSTANDING OF THE MATHEMATICAL CONCEPT AND MOTIVATION

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ABSTRACT

This study aims to develop the characteristics of learning devices with the RME ethnomathematics-based approach to improve students' understanding of mathematical concepts and motivation. This study uses the Plomp model which consists of 3 phases, namely Preliminary Research, Prototyping, and Assessment. The subjects of the study were the grade IX students of SMP Negeri 5 Singaraja in the academic year 2019/2020. The methods used to collect data were questionnaires and tests. The instruments used were validation sheets to obtain the validity data of learning devices, implementation sheets of learning devices, teacher and student response questionnaires to obtain the practicality data of learning devices, also tests of understanding mathematical concepts and student motivation questionnaires to obtain the effectiveness data of learning devices. The results of the study were the learning devices had valid, practical and effective qualities. The student book emphasizes student-centered learning, contains problems that are close to student life, uses the RME steps to construct student understanding, starts problems with batik Nusantara culture to instill the concept of geometric transformation. Teacher guidebook helps the teacher in the learning process, includes alternative actions and answers, contains lesson plans that are appropriate to the learning process based on the RME approach.

KEYWORDS: Learning Devices, the RME Approach, Ethnomathematics, Understanding Mathematical Concepts, Student Motivation.

1. INTRODUCTION

Gazali (2016) states mathematics is a science of how to think not only teaches how to count and solve a problem. Based on the regulation of the Minister of Education and Culture No. 21 of 2016 states that one of the goals of learning mathematics in school is so that students can understand the mathematical concepts being studied. Therefore, understanding mathematical concepts is very important in learning mathematics. Mwakapenda (2004); Ghazali and Zakaria (2011) states that students' understanding of the concepts learned is an essential part of learning mathematics today.

However, in reality, the understanding of mathematical concepts possessed by students is still quite low. This is also found in Triwibowo's research (2018) who find that the understanding mathematical concepts are fairly low, one proof is that students still have difficulty in presenting a concept with various forms of representation, such as students still having difficulty understanding story questions, so that when they asked to write in the form of mathematical sentences, students tend to be still wrong. One of the factors that cause a low understanding of students' mathematical concepts is students' motivation. This is confirmed by Rini (2016) which states that learning mathematics requires a good and correct understanding of concepts supported by providing learning motivation so students can accept and understand everything related to the material explained by the teacher.

Meanwhile, the material that is difficult for students to understand is geometry transformation material. Tunissa et al (2018) state that there are still many students whose learning outcomes are low on the material of transformation geometry. Even though geometry transformation is one of the important mathematical material students learn. Albab et al (2014) state that knowledge about geometry transformation is very useful for students to build spatial abilities, geometry reasoning abilities, and strengthen mathematical proof. Geometry transformation is quite difficult to learn because it is abstract (Haqq et al, 2019) so this also makes students' understanding of mathematical concepts particularly low geometry transformations.

Therefore, in learning geometrical transformation material, an approach with realistic elements can be used. Ni'am (2016) states learning geometry material as one of the abstract material in the learning process should begin with realistic problems. Realistic problems can be applied to the learning process by one of them using learning approaches that are related to daily life such as the RME (Realistic Mathematic Education) approach. Yuhasriati (2012) says that a realistic approach in mathematics learning in school mathematics learning that can instill mathematical concepts in their students. Sarjiman (in Albab, 2014) states that learning geometry with realistic mathematics education has also been proven to be successful in increasing student achievement. This is also emphasized by Tunnisa et al (2018) that learning with a realistic mathematics education approach (PMR) provides opportunities for students to understand and build geometry concepts of transformation which include translation, reflection, rotation, and dilation.

Daily problems that are often found by students who have a connection with the transformation of geometry, one of them is batik Nusantara culture. Fadila (2017) finds in batik Lampung motifs the use of transformation such as translation in multiplying motifs in a line, rotation can form patterns in reverse, reflection can form the same side by side, and dilation can form patterns that enlarge or shrink with the results of the same batik pattern with different shapes in making batik Lampung. The term that connects culture and mathematics is called ethnomathematics. D'Ambrosio (1985) the term ethnomathematics is defined as mathematics that is practiced among identified cultural groups such as ethnic national societies, labor groups, children of certain age groups and professional classes.

In applying the learning process with the RME ethnomathematics-based approach, it can be poured into learning devices such as book. The book is designed to contain daily problems with the culture of the motif of batik Nusantara which has a connection with the transformation of geometry through the RME approach will be more interesting for students. Therefore, it is considered necessary to develop learning devices with the RME approach based on ethnomathematics in an effort to improve students' understanding of mathematical concepts and motivation.

2. MATERIALS AND METHODS

a. Materials

A. Understanding the Concept

Hudojo (2003) states that learning mathematics means learning concepts and structures contained in the subject being studied and looking for relationships between concepts before having skills in solving problems.

In this study, the expected understanding of mathematical concepts is the understanding of mathematical concepts according to the indicators described in NCTM. Therefore, students can be said to understand the concept of a mathematical material if students can: (1) restating the concepts learned in their own words, (2) identifying those that are examples or not examples of a concept, and (3) being able to apply concepts in various situations. The understanding of students' mathematical concepts is measured by tests of understanding mathematical concepts.

B. Learning Motivation

Frederick J. Mc Donald in H. Nashar (2004) states that motivation to learn is a change of energy in a person which is marked by the emergence of feelings and reactions to achieve goals. According to Suprijono (2011) the nature of learning motivation is internal and external encouragement to students who are learning to make behavioral changes. So it can be concluded that learning motivation is a condition that drives a person to learn both from within and externally to achieve certain goals.

C. Etnomatematika

The term ethnomathematics comes from the word ethnomathematics, which was introduced by D'Ambrosio, a Brazilian mathematician in 1977. It is formed from the words ethno, mathema, and tics. The ethno prefix refers to cultural groups that can be recognized, such as tribal associations in a country and professional classes in society, including their language and daily habits. Then, mathema here means to explain, understand, and manage real things specifically by counting, measuring, classifying, sorting, and modeling a pattern that appears in an environment. The suffix tics contain artistic meanings in engineering. In terms of ethnomathematics interpreted as mathematics practiced among cultural groups identified as national societies, ethnics, labor groups, children of certain age groups and professional classes (D'Ambrosio, 1985). Then it can be concluded that ethnomathematics is mathematics that arises and develops in society and is in accordance with local culture.

Indonesia is an archipelago or often also called the Nusantara. There is a wide variety of ethnic groups, languages, arts and culture, also the rich flora and fauna in it. Specifically in terms of arts and culture, Indonesia is a country that has a variety of cultures that can be used to teach mathematical material such as batik culture. Batik is one of Indonesia's cultural heritages. The motif of batik is nothing but the result of applying mathematical concepts. As research conducted by Sudirman (2018) which explains one of the activities of the Indramayu people who unconsciously use the concept of geometry that is in making batik Indramayu's paoman patterns. Various kinds of batik from every city such as Indramayu, Lampung and other cities even to the inter-island batik using the concept of geometrical transformation, namely translation, rotation, reflection and dilation. So, an educator can use this in instilling and teaching the concept of geometrical transformation to students.

***D. Realistic Mathematics Education* (RME)**

Realistic in this case is intended not to refer to reality but to something that can be imagined by students expressed by Slettenhar (Ningsih, 2014). Gravemeijer (1994) states that the principles of the RME approach are as follows.

1. *Guided reinvention/progressive*
2. *Didactical Phenomenology*
3. *Self Developed Models*

Treffers, et al (in Setiani, et al, 2015) explain that there are five characteristics of the RME as follows.

1. Using the “Real World” Context
   In the RME approach, learning begins with realistic problems, thus allowing students to use previous experience directly. The process of searching (the core) of suitable concepts from real situations is stated by De Lange (1987) as a conceptual mathematical. Through abstraction and formalization students will develop more complex concepts. Then, students can apply mathematical concepts to new fields of the real world (applied mathematization). Freudenthal (1991) states that to bridge mathematical concepts with everyday student experience, it is necessary to pay attention to the mathematization of everyday experience and the application of mathematics in everyday life.
2. Using Models
   The term model relates to situation models and mathematical models developed by students themselves (self developed models). The role of self developed models is a bridge for students from real situations to abstract situations or from informal mathematics to formal mathematics. First, students create a situation model that is close to the real world of students. Generalization and formalization of the model will turn into the model-of the problem. Through mathematical reasoning the model-of will shift to model-for similar problems. In the end, it will become a formal mathematical model.
3. Using Production and Construction
   Streefland (Depdiknas, 1994) stresses that by making "free production" students are encouraged to reflect on the part that they consider important in the learning process. Informal strategies of students in the form of realistic problem-solving procedures are a source of inspiration in the development of further learning, namely to construct formal mathematical knowledge.
4. Using Interaction
   Explicitly forms of interaction in the form of negotiation, explanation, justification, agreement, disagreement, questions or reflection are used to achieve formal forms of students' informal forms. Forms of

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interaction formed between students and teachers, students and students as well as students with their learning environment.

5. Using Relationships
   In the RME, the integration of mathematical units is essential. If in learning we ignore links with other fields, it will have an effect on problem solving. In applying mathematics, it is usually necessary to have more complex knowledge, and not only arithmetic, algebra, or geometry but also other fields.

Based on the understanding, principles and characteristics of the Realistic Mathematic Education approach according to Irwan Rozani (2010) the steps of the RME are as follows.

Step 1: Understand realistic problems

In this step the teacher presents realistic problems to students. Then the teacher asks students to understand the problem first. The characteristics of the Realistic Mathematic Education approach that appear in this step are using context.

Step 2: Explain the problem

This step is taken when students have difficulty understanding the problem. In this step the teacher gives help by giving instructions or questions as needed that can lead students to understand the problem. The characteristics of the Realistic Mathematic Education approach that appears in this step are interactive, namely the interaction between the teacher and students and between students and students.

Step 3: Resolve the problem

At this stage students are encouraged to solve problems individually based on their abilities by utilizing the instructions provided. At this stage, the two principles of the Realistic Mathematic Education approach that can be raised are guided reiventation / progressive mathemazing and self-developed models. The characteristic that can be raised is the use of the model. In solving problems students have the freedom to build models of these problems.

Step 4: Comparing and discussing answers

At this stage the teacher first asks students to compare and discuss each other's answers. Next the teacher asks students to compare and discuss the answers they already have in class discussions, while the characteristics of the Realistic Mathematic Education approach that appear at this stage are interactive and use student contributions. Interactions can occur between students and students also between teacher and students.

Step 5: Conclude the problem

From the results of class discussions the teacher directs students to draw conclusions about solving problems, concepts, procedures or principles that have been built together. At this stage the characteristics of the Realistic Mathematic Education approach that emerge are interactive and use student contributions.

E. Ethnomathematics-Based Learning Devices with the RME Approach

Learning devices that will be developed refer to ethnomathematics based learning with the RME approach. In realistic mathematics things like traits, definitions and theorems are expected to be found by students through solving realistic problems given by the teacher at the beginning of learning. RME encourages students to actively work, and is even expected to be able to construct or build their own knowledge gained. Real life problems are used as a starting point for learning and students are given the opportunity to solve problems in informal ways. Through problem solving, class interaction, and reflection it is expected that informal ways by students develop towards formal mathematics. Ethnomathematics which is used in this case is batik culture in several regions of Indonesia in the study of the concept of geometry transformation. Based on Susanti's study (2014), there is a relationship between transformation geometry and some batik motifs. This is one of the society activities that unconsciously uses the concept of geometry when making batik patterns in the form of translation, reflection, rotation and dilation. The following are some examples of batik that will be loaded in learning devices (teacher and student books) that will be developed specifically on the material of geometry transformation.

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1. Translation

Figure 1. Motifs of Batik Translation

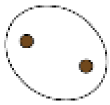
a. From the picture we get a batik pattern that matches the translation material.

b. The shape of the motif can be seen as the result of translating the basic form.

2. Reflection

Figure 2. Motifs of Batik Reflection

Its basic form is ellipse,



The formation of the batik kawung motif can be seen as a result of reflection of the basic form. The results reflected on the x, y, and z lines produce the following shape orientation.

The combination of the three images above reflects the result of batik motif image 2.

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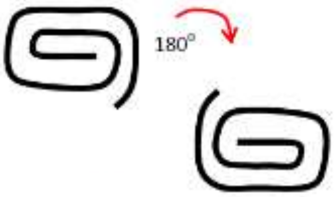
3. Rotation

Figure 3. Motifs of Batik Rotation

The basic form of the batik Papuan motif is a curved line.

Furthermore, the basic shape is rotated 180°.



4. Dilation

Figure 4. Motifs of Batik Dilation

Pay attention to the lotus-like motifs on the sasirangan. The basic form of the lotus flower is a flat shape that can be seen as a lotus flower petals, then through some rotation and reflection the arrangement of flower petals forms a lotus.

The lotus flower which is painted on the kangkung kangkakan motif above has different sizes, where the size the flower can be seen as a result of dilation or multiplication with a constant *k* to the shape of the picture above.

From some examples of batik motifs given above, it can be said that the concept of transformation geometry can be used in the culture around the society. Besides the examples above, there are still many examples of batik motifs that use the concept of geometry transformation.

F. The Relationship between Ethnomathematics-Based Learning Devices with the RME Approach towards the Students' Understanding Mathematical Concepts and Motivation

Ethnomathematics-based learning devices with the RME approach is a learning device which emphasize that learning does not begin with definitions, theorems or traits and then continue with examples, as has been done in various schools. Through the RME approach students are encouraged to construct their own knowledge. Real life problems are used as a starting point for learning and students are given the opportunity to solve problems in informal ways. Prabowo and Sidi (2010) state that the realistic mathematics learning approach is one of the approaches developed to bring students closer to mathematics.

The daily problems that are used are Nusantara culture such as batik. The term that links mathematics and culture is called ethnomathematics. Ethnomathematics in this case is poured into learning devices (teacher and student books). A meaningful learning process with the RME will affect students' understanding of mathematical concepts. Jailani (2016) states that meaningful learning will improve students' understanding of concepts and student memory. In addition, by pouring Ethnomathematics into learning devices (teacher and student books) will improve student motivation. This is in line with the statement from Nurliastuti, et al (2018) that one of the ways in order to increase student motivation can be done by involving the culture of student residence.

b. Methods

This research is a development research, referring to the Plomp development model with three phases, namely Preliminary Research, Prototyping, and Assessment. The place of research is SMP Negeri 5 Singaraja in the odd semester of the academic year 2019/2020. Research subjects are experts, students, and teachers. The experts' role is to obtain data regarding the validity of the learning devices. The second research subject is students. Students play a role to obtain data about the practicality and effectiveness of learning devices. The other research subject is the teacher. The teachers' role is to obtain data about the practicality of the learning devices.
The several research instruments used are as follows.

The instrument to measure the validity of the learning devices developed was the validation sheet of students' mathematics books and teacher's guide math books. The validation sheet was filled by three experts namely two lecturers of the Mathematics Education Study Program at Universitas Pendidikan Ganesha and one mathematics teacher of the gradeIX of SMP Negeri 5 Singaraja.

Table 1. Validity Criteria of Learning Devices

Score	Criteria
$3{,}5 \le Sr \le 4{,}0$	Very valid
$2{,}5 \le Sr < 3{,}5$	Valid
$1{,}5 \le Sr < 2{,}5$	Invalid
$1{,}0 \le Sr < 1{,}5$	Very invalid

(Sadra in Noviyanti, 2016)

Instruments to measure the practicality of the developed learning devices are observation sheets of the implementation of the device, student questionnaire responses to student books and teacher questionnaire responses to learning devices (student books and teacher books).

Table 2. Practical Criteria of Learning Devices

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Score	Criteria
$3{,}5 \leq Sr \leq 4{,}0$	Very Practical
$2{,}5 \leq Sr < 3{,}5$	Practical
$1{,}5 \leq Sr < 2{,}5$	Not Practical
$1{,}0 \leq Sr < 1{,}5$	Very Not Practical

(Sadra in Noviyanti, 2016)

Instruments to measure the effectiveness of learning devices developed include: instruments for evaluating student motivation and tests of understanding mathematical concepts.

Table 3. Completion Criteria of Students' Understanding Mathematical Concepts

No	Score	Criteria
1	$72 \leq \overline{X} \leq 100$	Passed
2	$0 \leq \overline{X} \leq 72$	Not Passed

Table 4. Criteria of Evaluation Results of Student Motivation

No	Criteria	Qualification
1	$B \leq x < B + C$	Very Low
2	$B + C \leq x < B + 2C$	Low
3	$B + 2C \leq x < B + C3$	Medium
4	$B + 3C \leq x < B + 4C$	High
5	$B + 4C \leq x < A$	Very High

(Larasati, 2016)

3. RESULTS AND DISCUSSION

Results

1. Results of Development of Learning Devices

The process of developing learning devices using Plomp's development theory goes through three phases. In the results of the preliminary research phase, it was found that there were still many obstacles faced by the teacher in the learning process, namely: (1) The learning process carried out is still teacher centered, (2) Student learning tends to memorize the material (3) Lack of active participation from students, (3) Teachers rarely develop learning devices that support learning activities, (4) Textbooks used by students currently do not involve students in the acquisition of concepts, (6) Learning devices used as a whole do not incorporate cultural elements, (7) Lack of student motivation when asked to argue during learning. In addition, judging by the class promotion test of grade VIII, most students still scored below the KKM.

The results of the second phase which is called the prototyping phase, after researchers had designed a device to be developed called prototype I, the learning device was validated by three experts namely the lecturers from Universitas Pendidikan Ganesha of the Ganesha Education Department and one mathematics teacher in grade IX of SMP Negeri 5 Singaraja, there were some criticisms and suggestions given to improve the learning devices developed namely student book and teacher guidebook on the subject of geometry transformation. Some suggestions and criticisms given were: (1) the nature of transformation types is more complete, (2) addition of the characteristics of the RME and ethnomathematics, (3) editorial corrections so as not to cause ambiguous and biased meaning. Besides books, other instruments were also prepared such as the implementation sheet, student response questionnaire sheet, teacher response questionnaire sheet, lesson plan, concept understanding test and student motivation questionnaire sheet, the instruments were also validated. The revised prototype I was called prototype II which was ready to be trialed in the field. In a limited field trial two meetings were held to see the feasibility of learning by using the learning devices that were developed, there were some improvements in learning devices such as the improvement in giving examples of apperception that should be given and giving examples first when the activity found the formula. The revision of prototype II was called prototype III which was then retested, namely the field trial I. In the field trial I, at the final meeting a test was conducted to measure students' understanding, the teacher and students filled in the response questionnaire provided and the students filled out the student motivation questionnaire through two stages namely stage I at the third meeting and stage II at the last meeting. Some revisions were obtained, namely the improvement of editors in each sub-topic so that each step was clarified in the learning devices.

The results of the third phase were called the assessment phase. The revised prototype III, called prototype IV, was retested, namely field trial II. At the end of the meeting in the field trial II, students and teacher filled out a questionnaire related to responses regarding the learning devices developed to determine the level of practicality. Students also did an evaluation with a test to understand mathematical concepts and filled in student motivation questionnaires through two stages, namely stage I at the third meeting and stage II at the last meeting. The results of the assessment were used as material for revision, so the final product was obtained. Based on the results of the field trial II, the activities of the revision of student books and teacher guidebooks were not done too much. The revision only focuses on readability, choice of words and sentences and typing errors in student books and teacher guidebooks until the final product was obtained.

2. Quality Results of Learning Devices

The results of the validity of the learning devices that have been validated by three experts obtained the results that the value of the validity of the learning devices with the RME ethnomathematics-based approach to improve students' understanding of the mathematical concept and motivation of grade IX of Junior High School developed in this study were student books and teacher guidebook classified as valid with an average validity score of 3.46. Other instruments such as RPP were classified as very valid criteria with a score of 3.65. Execution sheet, student response questionnaire, teacher response questionnaire according to validator I is feasible to be used without revision while according to validator II is feasible to be used but with some revisions. In the instrument of concept understanding test according to the two validators relevant to use.

The results of the practicality of the learning devices could be seen from the results of filling out the learning implementation sheet, the student response questionnaire and the teacher response questionnaire to the learning devices developed. The results obtained for the feasibility sheet in a limited trial overall average score of the 1st and 2nd meeting is 2.95 which is included in the practical category. In the field trial I, the average overall score was 3.26, which was included in the practical category. Whereas in the second trial II, the average score of the two observers was 3.38 which was included in the practical category. The results of filling in the questionnaire responses of students in the limited trial, field trial I and field trial II were respectively obtained an average score on the learning device that is 3.25, 3.26 and 3.41 those three values were included in the practical category. The results of filling out the teacher's response questionnaire in the limited trial, field trial I and field trial II were respectively 2.28, 3.56 and 3.72. This shows that in the limited trial the teacher guidebook was classified in the practical category and in the field trial I and II the teacher guidebook was classified in the very practical category. Based on practicality instruments, the learning devices developed in this case were student books and practical teacher guidebook used in the learning process.

The results of the effectiveness of learning devices refer to the average test scores of understanding mathematics concepts and motivation questionnaires obtained by students. From the results of the analysis it was found that the average value of students in field trial I was 80.20 and the average value of students in field trial II was 83.33. The average score of students in both the field trial I and field trial II showed the results of the concept understanding test were classified in the "Passed" category because this value has exceeded the KKM set in the school. Similarly, on the average student motivation questionnaire scores obtained in field trial I and II in stage 1 respectively 45.20 and 47.65 both of these scores were in the medium category. While in stage 2 the student motivation questionnaire scores were obtained in field trials I and II respectively 48.72 and 49.29 both of these scores were in the high category. It showed that there was an increase in categories from stage 1 to stage 2, from medium to high, so this indicated that the motivation of students using the learning devices developed was improved.

Discussions

In terms of validity, the learning devices developed has met the validity criteria shown by the average score given by three experts in education called the validator. The average score is the one who can conclude that the learning devices developed have met the valid criteria. The several reasons for the learning devices developed (in this case are student books and teacher gaidebook) can meet valid criteria including (1) the student book developed in this study has fulfilled the characteristics of the RME learning approach, (2) the learning devices arranged are in accordance with the curriculum demands found in the school. (3) the components of the learning devices with the RME ethnomathematics-based approach that have been developed are in accordance with the components specified in the learning devices validation sheet with some revisions to the suggestion and input from each validator.

Practicality of learning devices can be seen from three things, namely: (1) learning achievement sheet, (2) student responses to the implementation of learning (student books) and (3) teacher responses to the implementation of learning (student books and teacher guidebook). From the results of field trials regarding learning devices, it is found that the average level of performance and response of students has been included in the practical category while the teacher response questionnaire in the trial is limited to the practical category and field trial I and II fall into the very practical category.

Although the learning devices developed have been included in the practical category, but there were some obstacles encountered in the limited trial activities in class IX H which were conducted during 2 meetings. As for some of the obstacles encountered during the learning process, namely: (1) students are still not familiar with the activities conveyed in student books, (2) the teacher is still getting used to the learning activities that are directed in the teacher guidebook, (3) students are still hesitant in expressing their opinions during the discussion or at the activity presenting the results of group discussions and (4) there is still some students' curiosity needs to be raised and provoked in the learning process. Based on these problems, the causes of the constraints during the learning process are allegedly because teachers and students are not accustomed to following learning or direction in accordance with the demands of the learning device developed which is more demanding for students to construct their knowledge, one of which is to find the formula for each type of transformation through the use of culture with the RME steps. Following up on the obstacles faced by the teacher and students during the first meeting, the researcher and the teacher designed the handling of these constraints. The treatments that the teacher and the researcher designed turned out to have a positive impact on the implementation of learning activities at the next meeting. This is evidenced by the results on the observation sheet in a limited trial where the average score of the learning instrument implementation was 2.75 at the first meeting and was successfully increased to 3.15 at the second meeting and meant that the learning devices used were included in the practical category. These results also provide a decision that the developed learning device is ready to enter the next stage, namely field trial I. Reviewing the learning in the field trial II that took place in class IX-J, the teacher and researcher together applied the results of reflection in the first field trial so that the same obstacles encountered in the previous trial could be overcome in this second trial.

In addition to the score on the learning devices implementation, to see the practicality of the learning devices, questionnaires were also given for students and teachers to respond. The results showed that according to students learning devices developed, in this case student books were practically used by students during learning. The reasons were because the appearance and contents of the book were interesting and the contents of the book were easy for students to understand. In addition, students found it helpful to understand the concept of geometry transformation using the student book that was developed.

Based on the results of the trials that had been submitted previously, the learning devices with the RME ethnomathematics-based approach developed in this study are said to be effective because they have been able to achieve the learning objectives set, in this case the understanding of students' mathematical concepts and students' motivation as an impact of the learning devices applied looks to the average score of students' understanding of mathematical concepts obtained has increased. This shows that the average obtained from the two classes has been above the specified KKM, as well as the average score of student motivation questionnaires that have increased from the medium to high categories. Therefore, it can be said that teaching and learning devices have met the effective criteria because they have met the minimum completeness criteria

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on the average score of students' understanding of mathematical concepts and fulfilled the students' minimum motivation criteria.

Things that support the effectiveness of the learning devices developed are in the initial stages of learning the teacher conveys the learning objectives to be achieved and emphasizes to students the importance of the material to be learned, the teacher motivates students by providing examples of real problems related to the sub subject matter to be studied. Motivation is done through giving initial problems to students relating to the description of batik that is adapted to the sub-subject matter discussed, for example in reflection, in books given problems in the form of questions.

Figure 1. Introduction to the Student Book for Reflection Material

The next step, the teacher explains the initial problem to be solved by carrying out the activities contained in the book using the RME approach. Through this activity, students will be able to find and solve the initial problems given previously, such as the nature and understanding of the type of transformation being discussed. After students and their groups work on the activities in the book, the teacher directs students to present and compare the answers of each group to find out the extent of students' understanding of the sub topics being discussed. The final stage is to conclude from the activities that have been carried out. After students carry out discussions and presentations in front of the class. The teacher together with students conclude the material discussed during the lesson by appointing representatives of several students. Thus, overall the learning devices that have been successfully developed in this study have met the valid, practical and effective criteria.

4. CONCLUSION

This research has succeeded in developing learning devices with the RME ethnomathematical-based approach which are valid, practical, and effective as well as has characteristics that distinguish it from other learning devices. The characteristics of learning devices in this study are as follows.

a. Characteristics of student books developed in this study are (1) Student books contain learning activities according to the stages of the RME approach, (2) Students construct their understanding of concepts learned through initial problems with ethnomathematics of batik culture, (3) Student books contain problems that are close to student life related to the material being studied and (4) In the student book there is space for students to write conclusions and reflections.
b. Characteristics of teacher guidebook developed in this study are (1) The teacher guidebook makes the teacher easier in the learning process in class, (2) The teacher guidebook contains alternative actions and is equipped with alternative answers and (3) Filled with lesson plans appropriate to the learning process with the RME approach.

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