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by Adi Wibawa

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Analysis of Students' Abilities in Solving Realistic Mathematics Problems Using "What-If"-Ethnomathematics Instruments

I Putu Ade Andre Payadnya, I Ketut Suwija, Kadek Adi Wibawa

Mathematics Education Study Program, Universitas Mahasaraswati Denpasar, Bali, Indonesia
adeandre@unmas.ac.id, swjdkhsari@gmail.com, adiwibawa@unmas.ac.id,

Abstract: The research aimed to analyze the students' abilities in solving realistic mathematics problems using "What-If"-Ethnomathematics Instruments with content focused on plane and space materials. The "What-If"-Ethnomathematics instruments are instruments that enable educators to analyze various errors and obstacles experienced by students in solving realistic problems by prioritizing applied and culture mathematics and questions that test students' mathematical thinking skills. The research design was descriptive qualitative. The subjects of the research were 46 students of SMP Widiatmika in the 2020/2021 academic year. The data collection method using a test, interview, and documentation. The data was then analyzed using qualitative descriptive data analysis with the following stages: data reduction, data presentation, and drawing conclusion and verification. The result showed that the students' abilities in solving realistic ethnomathematics problems using "What-If"-Ethnomathematics Instruments" are still lacking which include: errors in understanding the problems, errors in representation, errors in reasoning, errors in answering "What-If" Questions. The highest errors were errors in reasoning, which was 69.56% of all students, followed by errors in answering "What-If" Questions of 65.21%, then errors in understanding the problems 43.47%, and finally errors representation as much as 34.78%. From the results of an interview, teachers tend to provide learning that focuses on the delivery and use of formulas and ignores the understanding of concepts and improved thinking skills of students based on realistic mathematics problem-solving.

INTRODUCTION

Mathematics is an important subject in the development of education of a student. Mathematics is a universal science that underlies the development of modern technology today, this is because mathematics has an important role as a means of solving life problems (Graciella, 2016; Dewimarni, 2017). Following the National Council of Teachers Mathematics, mathematical reasoning and problem-solving are important for the development of mathematics education.

There are various types of problems in mathematics, but one of the problems that are the main developments in mathematics is realistic problems. Gravemeijer, et al (2004) describe realistic problems as a problem that constructed from a concrete or paradigmatic situations that are experientially real for students and allowed the students to communicate reasoning strategies. Realistic problems are very important because the purpose of learning mathematics requires students not only to understand the concept but also to apply the concept to solve everyday problems. Realistic Mathematics Education (RME) is an approach to learn mathematics that was

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developed in 1971 by a group of mathematicians from the Freudenthal Institute, Utrecht University in the Netherlands. This approach is based on the assumption that Freudenthal (1973) emphasizes that mathematics is a human activity. According to this approach, the mathematics classroom is not a place to transfer mathematics from the teacher to students, but a place where students rediscover mathematical ideas and concepts through exploring real problems. In realistic mathematics learning, before students are brought to an 'informal situation', starting with real problems first, then students with the help of the teacher are allowed to rediscover and construct their concepts and then apply them in everyday problems or other fields (Romadoni & Rudhito, 2016).

The low mathematical ability of students can be seen from the assignments and students' difficulties with the material being studied. Learning difficulties are students' inability to master facts, concepts, principles, and skills (Waskitoningtyas, 2016). Students' problem-solving abilities are still relatively low. As many as 73% of students still have relatively poor problem-solving skills (Sumartini, 2016). Students have difficulty solving non-routine mathematical problems that contain many concepts and procedures (Mawaddah & Anisah, 2015). Students are always confused when given problems related to cases in everyday life so that many errors occur. done by students and causes learning to be not optimal. Therefore, understanding what mistakes are made by students in solving real problems is very important (Moru, 2014).

Errors that are usually made by students in working on description problems are caused because students find it difficult to understand the problem solving contained in the problem. The results of Moru, et al (2014) suggest that error analysis can increase knowledge in teaching, recognition of student errors, and error analysis of language, because some errors in mathematics are interrelated, and make an effort to gain an understanding of learning theories because they are related to how knowledge is learned and built by students

To support the success of the analysis of students’ ability in solving realistic mathematics problems, educators must use appropriate and effective instruments so that the results obtained are more detailed and accurate. One of the right instruments to use is "What-If"-Ethnomathematics Instruments which is based on the concept of "what-if" and ethnomathematics questions. The "What-If" question was first developed by Payadnya, et al where this question allows students to go through two levels of problem posing, namely "accepting the problem" and "challenging the problem" (Payadnya et al, 2016). At the level of "challenging the problem", new questions can arise from the problem. the. Ethnomathematics is defined as mathematics practiced by cultural groups, such as urban and rural communities, labor groups, children of certain age groups, indigenous peoples, and others (Rachmawati, 2012). Ethnomathematics can also be considered as a program that aims to study how students can understand, articulate, process, and ultimately use mathematical ideas, concepts, and practices that can solve problems related to their daily activities.

Research by Lubis, et al (2017) found that students' ability to solve mathematical problems in terms of planning and re-examining answers is very low. Meanwhile, Sipayung (2020) found that in solving math problems, students have not been able to solve math problems.: detailed mathematical ideas, apply concepts and algorithms in solving problems in detail, and understand the concepts or algorithms in solving problems in detail. Although it has analyzed students' problem-solving abilities, previous studies have not specifically addressed students' ability to solve

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real problems and still tend to use RME as a course approach. Therefore, it is very important to conduct an in-depth analysis of students' ability to solve realistic math problems using appropriate instruments that in this case "What-If"-Ethnomathematics Instruments.

Because of the importance of realistic problem-solving skills that students have for the success of math learning, the importance of knowing what are the obstacles experienced by students in answering realistic problems, researchers conducted research that focused on the analysis of students' abilities in solving realistic mathematics problems using "What-If"-ethnomathematics instruments that can help researchers to provide an in-depth description of students' abilities. Some of the questions proposed in this study are: 1) What are the abilities of student's abilities in solving mathematics realistic problems? 2) What are the mistakes of students and obstacles that occur in learning related to realistic problem solving and its causative factors? The data collection method using a test, interview, and documentation. The data was then analyzed using qualitative descriptive data analysis with the following stages: data reduction, data presentation, and drawing conclusion and verification.

RESEARCH METHOD

Research Subject

The place and time of the research were carried out at SMP Widiatmika Jimbaran in the 2020/2021 academic year. The research subjects were 46 students with details of 26 students from class 8.1 and 20 students from class 8.5. Students already have basic knowledge about material from problems that will be presented in instruments. Students have studied the material and perimeter of flat wakes as well as the surface area and volume of building rooms during grade 7.

Research Design

This study uses a qualitative research method that aims to show more accurately the students' mistakes in working on mathematical description problems with the subject of straight-line equations with "What-If"-Ethnomathematics Instruments. A qualitative approach was chosen to reveal more carefully about students' errors in solving mathematical description problems. In addition, with a qualitative approach, researchers can communicate directly with respondents to find out students' mistakes in solving story problems.

The type of research that will be conducted is descriptive qualitative research. Qualitative descriptive research was used to obtain data directly from data sources through tests and interview guidelines. This study is described to collect information about the analysis of student abilities in solving realistic problems using "What-If"-Ethnomathematics Instruments. The purpose of this research was to find out how students' ability in solving realistic problems using "What-If"-Ethnomathematics Instruments. This research will provide an overview of the problems faced by students in solving real problems that will be used basically by teachers in preparing the appropriate learning design in the future.

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Data Source

Data sources are sources from which data can be obtained. In this study, researchers used primary data sources and secondary data sources.

Primary Data

Primary data is data obtained directly from the source or object of research. In this study, researchers obtained primary data from the results of students' answers in doing questions and interviewing students that done on-line.

Secondary Data

Secondary data is data that has been published or used by other parties. In this study, researchers obtained secondary data from the literature, websites, and documents in the form of students' math scores in the previous semester from mathematics teachers.

Data Collection Techniques

In this study, several methods of data collection were used, namely as follows:

Test

The test used in this study is in the form of an essay test. Data collection methods are the results of students' answers in working on realistic problems with adapted materials. In this study, the test used was realistic math problems in the form of "What-If"-Ethnomathematics as many as 3 questions on shape and space materials. This means that the real questions presented contain mathematical concepts which are then expanded by "What-If" questions related to the problem. The ethnomathematical concepts presented in these 3 questions are ethnomathematical concepts contained in traditional Balinese culture, especially in terms of religious ceremony facilities and traditional buildings. The test is done online using the Google Classroom and Zoom apps.

Interview

The interview guide used in this study was an unstructured interview. Interviews were conducted on student representatives from the three categories (high, medium, and low) who made mistakes in solving problems. This interview aims to find out the factors that cause students to have difficulty in solving the given problems. Interviews are also conducted with teachers to find out how learning has been going on so far. Interviews are conducted online using the Zoom app at the end of the classroom activities.

Documentation

Documentation is looking for data about things or variables in the form of notes, transcripts, books, grades lists, student attendance lists, and so on. This documentation method is a technique used to obtain data on the students' mathematics test scores in the previous semester, the number of students in class VIII of SMP Widiatmika Jimbaran.

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Data Analysis Technique

The qualitative descriptive data analysis technique used in this study with the following stages.

Data Reduction

Data reduction is a form of analysis that sharpens, categorizes, directs, discards unnecessary data, and organizes data in such a way that conclusions can be drawn and verified. This activity leads to the process of selecting, focusing, simplifying, and abstracting the raw data written in field notes. The stages of data reduction in this study are: 1) Correcting the results of student work which is then ranked to determine students who will be used as research subjects, 2) The results of student work which are the subject of research which are raw data are transformed into notes as material for interviews, 3) The results of the interviews that have been carried out are simplified into a good and neat language arrangement, then translated into notes.

Data Presentation

Data presentation is a structured collection of information that provides the possibility of drawing conclusions and taking action. At this stage, the data in the form of student work are arranged according to the object of research.

Drawing Conclusions or Verification

Verification is part of a complete configuration activity so that it can answer research questions and research objectives. Comparing the results of student work and the results of interviews, conclusions can be drawn about the location and causes of student errors in working on realistic problems.

Data Validity Check

After the existing data is analyzed to find answers to the research problems, then check the validity of the findings. To determine the validity of the findings (credibility) an examination technique is needed. Examination of the validity of the findings in this study using triangulation techniques. In this study, the type of triangulation used is source triangulation, which is to compare and check back the degree of trustworthiness of information obtained through different times and tools in qualitative methods. The source triangulation stage carried out in this study was to compare the results of student work with the results of interviews.

Student Activities

Students were involved in learning activities related to ethnomathematics that conducted in whole class settings and individually. In general, these activities are divided into three steps, namely: opening activity, doing math, and interview. The total time allocation for these three activities is 150 minutes which are conducted on Saturdays outside of regular learn hours. Here's the explanation of each activity.

Opening Activity

Opening activity is carried out in a whole class setting where students in both classes follow online learning using the Zoom application. Students are given explanations by teachers assisted by

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illustrations using learning videos and power points on the concept of ethnomathematics and examples of ethnomathematics in their environment. Teacher then explained that there are many concepts of ethnomathematics in Balinese culture as well.

The teacher then gives examples of mathematical concepts and problems related in Balinese culture. In this case, the example given by the teacher focuses on the Balinese ceremonial tools as well as traditional building structures containing mathematical concepts. The concepts and problems provided by teachers will be similar to the problems presented in the next activity, *doing math*.

Doing Math

In this activity, students are given three ethnomathematical problems related to Balinese Culture. These problems are as follows:

1. *Gede will make a Klakat for a religious ceremony. Gede was given 12 pieces of bamboo that were ready to be assembled to make a Klakat. The length and width of the bamboo being 25 cm and 1 cm. How many holes can be in the Klakat designed made by Gede? What is the area and circumference of the Klakat and what is the total area of the holes in the Klakat?*

"What-If" Question Number 1:

a. *What if Gede is asked to make two Klakat from the pieces of bamboo provided? Can Gede make it? State your reasons.*
b. *What if Gede wants to strengthen the middle of his Klakat? What size bamboo is needed by him? How many? State your reason*

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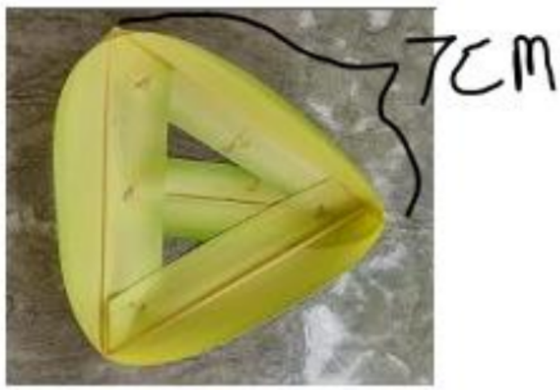
2. *Sintia wants to make Ituk-ituk with sizes like the one below.*



If Sintia has coconut leaves that are 1 m long each, how many Ituk-ituk can be made from one of these leaves?

"What-If" Question Number 2

a. *What if Sintia's mother asked Sintia to make 100 Ituk-ituk, how many coconut's leaves does Sintia need?*

b. *How can the Ituk-ituk be made to be twice as big as before? How many Ituk-ituk can be made from one coconut's leave?*

3. *Mr. Made will build a Pelinggih like the picture below on his land measuring 10x10 m.*

If the height of the Pelinggih roof is 1 m and the volume of the Pelinggih roof is 4 m^3, how many Pelinggih can be lined up on the ground?

"What-If" Question Problem Number 3:

a) *What if only the land area is known, which is 100 m^2, how do you find the number of Pelinggih that can be lined up?*

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b) *If Mr. Made wants to build a Sanggah/Merajan, how many Pelinggih roofs does Pak Made need, what are the variations in size? If necessary, draw the plan.*

Students are then given the opportunity to answer these problems individually using their basic knowledge of shape and space as well as ethnomathematics. The time allowed for this activity is 60 minutes. Students then write their answers on a piece of paper and then take a photo or scan of the answer and post it in Google Classroom.

Interview

At the end of the learning activities, interviews were conducted with 3 student representatives to find out student responses to the activities that have been carried out as well as student opinions regarding problems related to ethnomathematics in Balinese culture. In addition to students, interviews were also conducted with teachers to find out the teacher's response regarding ethnomathematics and learning situations that have taken place so far. This activity lasts for 30 minutes. The interview topic is around but not limited to these following questions:

What do you think about the problems given?

What's the hard part of solving ethnomathematics problems in your opinion?

Do ethnomathematics be interesting and challenging?

How do you respond to what-if questions given in each problem?

RESULTS

In collecting data, the researcher gave realistic mathematics test questions in the form of "what-if"-ethnomathematics to 46 students of SMP Widiatmika. Each student's answers were then analyzed and checked to find out what types of errors were made by the students in answering the three "what-if"-ethnomathematics problems given. From all student answers, there were 4 types of common errors made by students, namely: errors in understanding the problems, errors in representation, errors in reasoning, and errors in answering “what-if” questions. From each type of error, the number of students who make errors according to type then collected. The number of students who make mistakes in each type of error is then divided by the total number of students and then the percentage of the number of students in each type of error is obtained. The results of the students' problem-solving ability tests are shown in Table 1.

No	Error Type	Number of Error	Percentage
1	Understanding the problems	20	43,47%
2	Representation	16	34,78%
3	Reasoning	32	69,56%
4	Answering “What-If” Question	30	65,21%

Table 1: Type of Error of The Subject's Answer

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From the Table 2, it can be seen that the most types of errors made by students were errors in reasoning, where there were 32 students (69.56%) who made this type of error by not giving appropriate reasoning to the written answers. The second most common type of error made by students was answering "what-if" questions with a total of 30 students and a percentage of 65.21%, followed by the type of error in understanding the problems where there were 20 (43.47%) students who failed to understand the problems so that the answers made by students are incorrect. The last most common type of error is representation where there were 16 (34.78%) students who fail to make appropriate representations in answering the problems.

No	Category	Amount
1	High	10
2	Middle	22
3	Low	14

Table 2: Classification of Students' Problem-Solving Ability Categories

Analysis of Student Errors in Problem No. 1

Explanation: In problem Number 1, students are asked to solve the problem of making "Klakat" which is one of the Balinese Hindu ceremonial facilities which is usually square and used as a base for "Banten" or offerings. In this case, students are expected to be able to make good use of the number of rectangular bamboos provided and make a Klakat with the maximum size and number of holes. Some of the students' mistakes in answering this problem are presented in Figure 2 below.

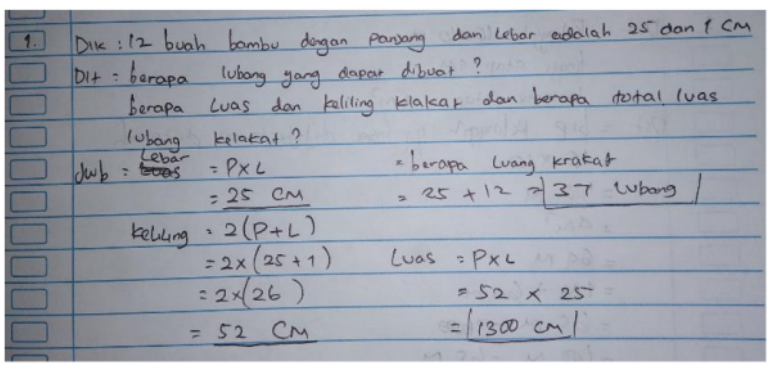

Figure 1. Examples of Student Understanding Errors in Problem No. 1

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Translation:
Knowing: 12 bamboos with length and width is 25 and 1 cm
Question: How many holes can be made?
What is the area and circumference of the Klakat and what is the total area of the Klakat hole?
Answer: Area = Length x Width = 25 cm
Circumference = 2 (Length + Width) = 2 (25 + 1) = 2(26) = 52 cm
= what is the area of the Klakat holes = 25 + 12 = 37 holes
Area = Length x Width = 52 x 25 = 1300 cm

Explanation: In Figure 1, it can be seen that students have difficulty understanding the problems presented. In this case, students misinterpreted the size of the bamboo sticks that were presented as a measure of the length and width of the Klakat made so that in calculating the area and circumference students used p = 25 cm and l = 1 cm which is the length and width of each bamboo stick to be used. arranged into a Klakat. The final step that should be taken by students is to use 12 bamboo sticks to form a Klakat as shown in the picture where the 12 bamboo sticks can only be used to make 1 Klakat with 9 holes and the length and width of the bamboo sticks are used to determine the size of each hole. formed and calculate the area.

The next type of error is an error in reasoning as shown in Figure 2.

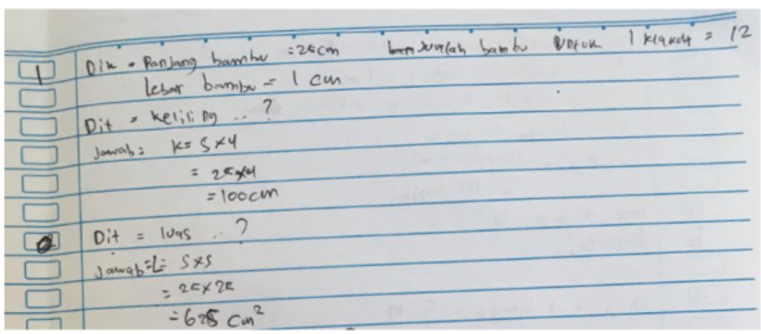

Figure 2. Examples of Students' Reasoning Errors in Problem No. 1

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Translation:
Knowing = Bamboos' length = 25 cm, amount of bamboos needed for 1 Klakat = 12
Bamboos' width = 1 cm
Question = cirsumference?
Answer: cirsumference = S x 4 = 25 x 4 = 100 cm
Question = area?
Answer: area = S x S = 25 x 25 = 625 cm^2

Explanation: In Figure 2 it is clear that students give answers without providing appropriate reasoning why students choose the solution. Students only provide raw answers without any appropriate reason or analysis why the calculation of the circumference and area of the Klakat is calculated using these methods and measures. The hope to be achieved is that students can analyze the problem well, and provide solutions with appropriate explanations, such as why only one Klakat can be made, why only 9-hole Klakat can be formed, and so on. Doing a representation by describing the design of the Klakat will also greatly support the reasoning that is done by students.

In addition to the main problems, this instrument also presents "What-If" questions which aim to see the extent to which students' ability to use their thinking skills to solve problems is also presented. Here are the "What-If" questions given.

Explanation: In "What-If" Question problem No. 1, students are expected to be able to give the right answer with appropriate reasoning even though the answers from students will vary but it doesn't matter if the reasoning given is correct. However, of the many answers, students are still not able to give proper reasoning and only give short answers. The following are examples of student answers.

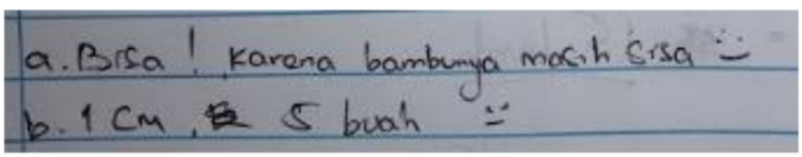

Figure 3. Example of Student Answers to the "What-If" Question No. 1

Translation:
a. *It is can because the bamboos are still left*
b. *1 cm, 5 pieces*

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Explanation: From Figure 3 above, it can be seen that students cannot provide reasoning and explanations for why they give such answers. Students only give short answers that seem answered without doing detailed analysis or calculations so that the answers given are less precise.

Analysis of Student Answers on Question No. 2

Explanation: In question No. 2, students are asked to make one of the Hindu prayer facilities called Ituk-ituk which is in the form of a triangle. In this problem, students are given material in the form of coconut leaves with a length of 1 m and are asked to make as many tucks as possible. The thing that students have to pay attention to is that not all parts of the coconut leaves can be used as Ituk-ituk because there are parts of the ends of the leaves that tend to be small. The following are examples of student answers.

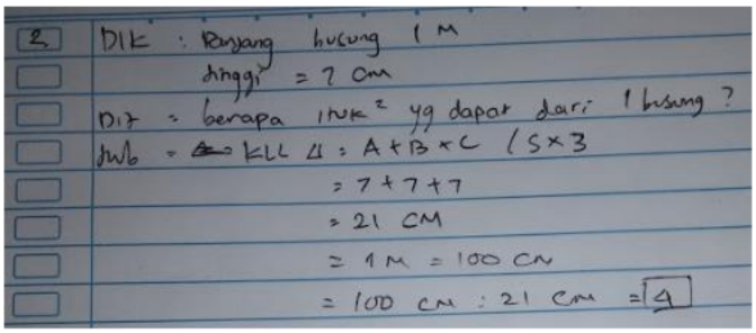
2 DIK : Panjang busung 1 M
tinggi = 7 CM
DIT : berapa ituk² yg dapat dari 1 busung ?
Jwb : KLL Δ : A + B + C (S × 3
= 7 + 7 + 7
= 21 CM
= 1 M = 100 CM
= 100 CM : 21 CM = 4

Figure 4. Example of Student Answers on Problem Number 2

Translation:
Knowing: coconut leaves length 1 m, Ituk-ituk high = 7 cm
Question: How many Ituk-ituk that can be made from 1 coconut leave?
Answer: Ciscumference of The Triangle = A + B + C (S x 3) = 7 + 7 + 7 = 21 cm
= 1 m = 100 cm
= 100 cm : 21 cm = 4

Explanation: From Figure 4 it can be seen that students make mistakes in solving the given problems. Students are less able to think realistically so they use all the leaves given to make "Ituk-ituk". The answer should be that students are able to imagine that not all parts of the leaves can be used as "Ituk-ituk" because the ends are too small so that at least students can subtract one fruit from the total "Ituk-ituk" obtained from calculations on each leaf.

Explanation: In the "What-If" question problem No. 2 students were asked to develop a problem with the condition that if the "Ituk-ituk" to be made amounted to 100 pieces and what if the size of the "Ituk-ituk" was doubled. To answer this "What-If" question, students must be able to analyze

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problems well and use their thinking skills to find appropriate solutions. The following are examples of student answers.

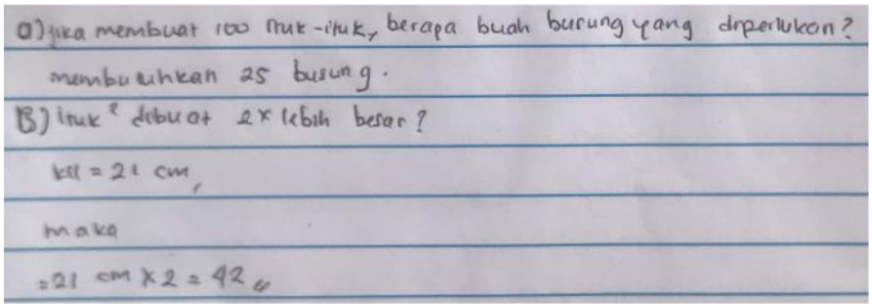
a) jika membuat 100 ituk-ituk, berapa buah burung yang diperlukan?
membutuhkan 25 burung.
B) ituk² dibuat 2x lebih besar?
kll = 21 cm,
maka
=21 cm x 2 = 42

Figure 5. Students' Answers to the "What-If" Question Number 2

Translation:

a) *If we made 100 Ituk-ituk, how many coconuts leaves are needed?*
   We need 25 coconut leaves.
b) *Ituk-ituk is made with 2 times bigger*
   Circumference = 21 cm, So = 21 cm x 2 + 42

Explanation: From Figure 5 it can be seen that students are less able to analyze the problems given. Students only give simple answers without appropriate reasoning. Students also experience errors in answering problems so that they provide answers that do not solve the problems given. This also shows that students are also not able to understand the problem well.

Analysis of Question Number 3

In question Number 3, the material switches to building space. In this problem, ethnomathematics related to traditional Balinese buildings in Hindu places of worship are in the form of rectangular pyramids. Here is question Number 4.

In answering problem Number 3, most of the students did not answer the problem correctly. Students do not provide detailed explanations and make mistakes in giving answers. This is because students do not make representations when answering problems. Representation is the key in solving problem Number 3.

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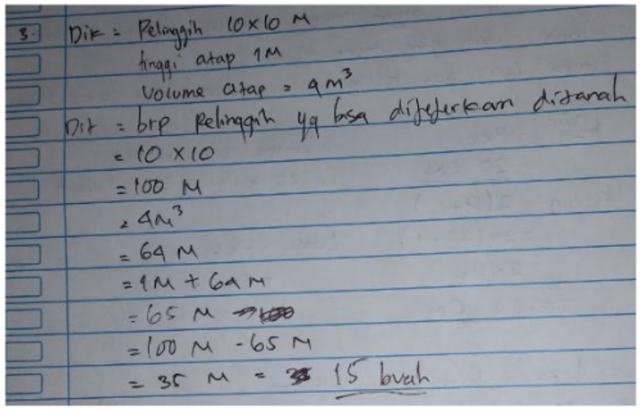


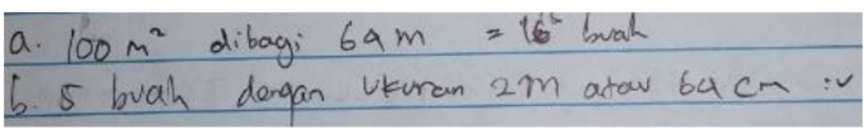
3. Dik = Pelinggih 10 x 10 M
tinggi atap 1 M
Volume atap = 4 m^3
Dit = brp pelinggih yg bisa dijejerkan ditanah
= 10 x 10
= 100 M
= 4 m^3
= 64 M
= 1 M + 64 M
= 65 M
= 100 M - 65 M
= 35 M = 15 buah

Figure 6. Student Answers to Problem Number 3

Translation:
Knowing: Pelinggih 10 x 10 m
Roof height 1 m, Roof volume = 4 m^3
Question: How many Pelinggih can be lined up on the ground?
Answer: 10 x 10 = 100, 4 m^3= 64 m, 1 m + 64 m = 65 m, 100 m – 65 m = 35 m = 15 Pelinggih

Explanation: From Figure 6 it can be seen that students make mistakes in solving problems. Students should find the size of the roof base first using the volume and height measurements given. After that, students can draw a map of the placement of the Pelinggih using the size of the roof obtained. However, students made the mistake of not calculating the size of the base of the pyramid-shaped roof and also not making representations to solve the problem. This indicates that students cannot understand the questions well and also cannot provide appropriate reasoning.

Analysis of the "What-If" Question Number 3



a. 100 m^2 dibagi 64 m = 16 buah
b. 5 buah dengan ukuran 2 m atau 64 cm :v

Figure 7. Students' Answers to the "What-If" Question Number 3

Translation:
a. 100 m^2 divided by 64 m = 16 Pelinggih
b. 5 Pelinggih with size 2 m or 64 cm

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Explanation: From Figure 7 it can be seen that students still make the same mistakes in answering the "What-If" questions by not reasoning the answers given. Students still tend to give short answers without an explanation of how to get the answer. This causes students to be wrong in answering the "What-If" questions given.

After working on realistic ethnomathematics problems, students are interviewed by teachers to get students' responses to the problems given and can understand more about the student's abilities. From interviews conducted, students mostly admitted that it is difficult to understand the problem and it is difficult to imagine it for real. Here is one of the interviews of students and teachers.

Teacher: How did you respond to these problems?

Student: Difficult sir

Teacher: Why is it so hard?

Student: It's hard to imagine that, sir.

Teacher: Why is it hard to imagine? You should know these concepts as Balinese.

Students: Yes sir, because we rarely engage in religious and cultural activities directly, we usually accept so and just follow what adults do.

From this answer, it appears that there is less able to understand the surroundings which is the basis in solving realistic problems. If associated with the RME principle (Zulkardi, 2002), students will not be able to go through the Guided Reinvention stage where students are unable to understand a contextual or realistic problem that subsequently through activities students are expected to rediscover traits, theorems, definitions, or procedures. Thus, students have difficulty in Didactic Phenomenology as well as Self Developed Models (self-model development) so that students are unable to connect their knowledge of real situations to abstract situations or from informal to formal mathematics and create their models in solving problems, with a process of generalization and formalization, the model eventually becomes a model according to mathematical reasoning.

From the results of interviews conducted with 3 student representatives selected from each student who scored in the high, medium, and low categories, it was found that most of the students expressed difficulty in answering realistic type questions. Students from the high group tend to be able to understand the questions, but always have difficulty in reasoning or do not think to do the appropriate reasoning. Students from the medium group tend to experience errors in writing calculations in solving realistic problems given and make mistakes in determining appropriate strategies to solve problems. Students from low groups tend to express difficulties in understanding the problems given so that they cannot solve problems properly.

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DISCUSSION

This study found that students make many mistakes in solving realistic math problems from various aspects. The following will be explained in more detail about the mistakes found in this study and explained further about how students' ability to solve realistic math problems.

Students are often misunderstanding the problem given. The researcher found that the first of the students' difficulties in solving realistic problems is that the students still lack the ability to understand the surrounding environment, including realistic concepts contained in their own culture, which causes students to be unable to understand realistic ethnomathematical problems properly (see Figure 1). Many students misunderstand the problems given and have difficulty in interpreting the meaning of the problems so that they are wrong in writing what is known from the problems presented. This is very strange because realistic problems are problems that are arranged based on students' daily lives so that they are easily understood by students, especially realistic problems with ethnomathematical themes which should be close to students because they have the theme of community culture. This is following the opinion of Triyas (in Sulistiyorini, 2015) which states that the difficulty of students in solving story or realistic problems in the aspect of understanding the problem is the difficulty of understanding what the meaning of the question is and the difficulty of students distinguishing shapes/symbols from what is known. This is fatal because, in RME, the use of context includes understanding it not as a form of application of a concept but as a starting point for the development of a concept (Wijaya, 2012). Understanding contextual problems are very important in learning using RME. Ahlfors (Wijaya, 2012) states that the extraction of appropriate concepts from a concrete situation, generalizations to observed cases, inductive arguments, arguments with analogies, and an intuitive basis in formulating a conjecture are forms of mathematical ways of thinking.

The second finding is that the students still show errors in making representations in solving problems. Students still have difficulty in doing appropriate work in solving realistic problems, even many students who consider representation unimportant (see Figure 6). This is following Suryowati's (2015) opinion which also revealed that students still do not understand how to represent real-world problems into representative mathematical problems. In addition, Syafitri et al (2021) stated that factors causing difficulties in the mathematical representation ability are non-visual aspects, representational aspects of mathematical expressions, and aspects of word representation or written text is a non-cognitive learning factor. Efforts can be made by teachers so that students have representational abilities by choosing and using the right learning approach so that the learning process takes place optimally and can develop mathematical representation abilities.

The third finding and the most common mistakes found in this research is the students' mistakes in reasoning in solving problems (see Fig. 2, 3, 5, 6). Most students answer the problem briefly without an explanation of why the answer appears and how the steps are taken to obtain the answer. This is following the opinion (Sulistiawati, 2014) also revealed that the majority of students' answer errors were in determining the work steps caused because students were less accustomed to working on mathematical reasoning questions. In addition, Ario (2016) stated that the various errors made by students were misunderstanding the meaning of the questions, errors using formulas, errors in performing arithmetic operations, not understanding concepts, and difficulties in writing reasons in written form.

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The last is students also make an error in answering the “What-If” Questions. This research found that many students did not understand the realistic problems given. Students tend to answer simply without the appropriate explanation and reasoning (see Figure 3, 5, 7). Students can’t show how the flow is until the answer is found and verify the answers obtained. This shows that students still do not understand the "What-If" questions given and are unable to use their reasoning abilities to imagine developing problems through the new situations presented. This is following the opinion of Payadnya et al (2016) which states that many students are confused in answering the "What-If" questions and have difficulty doing appropriate reasoning.

Of the errors found, researchers conducted observations and interviews with teachers. As a result, it was obtained that teachers have been applying learning that still focuses on the delivery and use of mathematical formulas. Teachers lack learning that focuses on mastering mathematical concepts and improving students' mathematical thinking skills which are the basis for solving realistic problems. In learning, teachers rarely give realistic problems and more to regular problems that only require the application of formulas with various variations. This causes students to be less able to delve into the material provided and often do not think critically of the acquired problems. This is following the opinion of Simon (1995) who states that students who tend to learn by applying mathematical formulas and procedures tend to be not well-examined conceptually. Seeing from this, a teacher needs to structure learning that is more oriented to understanding concepts and improving students' thinking skills. Learning must also present more realistic and projected problems so that students can better connect mathematical concepts with the real world. This is the basis of the success of Realistic Mathematics Education.

CONCLUSIONS

It was found that the student's abilities in solving realistic ethnomathematics problems using "What-If”-Ethnomathematics Instruments" is still lacking which include: errors in understanding the problems, errors in representation, errors in reasoning, errors in answering "What-If" Questions. The highest errors were errors in reasoning, which was 69.56% of all students, followed by errors in answering "What-If" Questions of 65.21%, then errors in understanding the problems 43.47%, and finally errors representation as much as 34.78%. Students also have difficulty in the Guided Reinvention stage where students are unable to understand a contextual or realistic problem that subsequently through activities students are expected to rediscover traits, theorems, definitions, or procedures an also Didactic Phenomenology as well as Self Developed Models so that students are unable to connect their knowledge of real situations to abstract situations or from informal to formal mathematics and create their models in solving problems, with a process of generalization and formalization, the model eventually becomes a model according to mathematical reasoning.

From the results of the interview, teachers tend to provide learning that focuses on the delivery and use of formulas and ignores the understanding of concepts and improved thinking skills of students. Therefore, to improve students' mathematical problem-solving skills and RME success, teachers must design learning that more often presents more realistic and projected problems so that students can better connect mathematical concepts with the real world.

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Analysis of Students' Abilities in Solving Realistic Mathematics Problems Using "What-If"-Ethnomathematics Instruments

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