

Malay Ethnomathematics: Analysis of Mathematics Learning Problem Solving based on Riau Malay Culture

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ABSTRAK

Abstract: The problem in learning mathematics today is that students' mathematics learning outcomes are still low, this is because students are less able to understand mathematical concepts and problem solving. The socio-cultural environment in mathematics can increase students' social interaction in learning mathematics. The process of learning mathematics should be associated with the socio-cultural environment of students. This study aims to analyze problem solving mathematics learning based on Riau Malay culture on the subject of two-dimensional figures or flat shapes. This type of research is a descriptive qualitative research. This type of research was conducted at Junior High School 1 Bunga Raya, Siak Regency for the academic year 2021/2022. The results of this research are the Analysis of Mathematics Learning "Problem Solving" based on Riau Malay Culture on the subject of flat shapes at high, medium and low levels. The percentage at each level is high 83.8%, medium 12.9% and low 3.3%.

Abstrak: Masalah dalam belajar matematika saat ini adalah bahwa hasil pembelajaran matematika siswa masih rendah, ini karena siswa kurang mampu memahami konsep matematika dan pemecahan masalah. Lingkungan sosial-budaya dalam matematika dapat meningkatkan interaksi sosial siswa dalam belajar matematika. Proses pembelajaran matematika harus dikaitkan dengan lingkungan sosial-budaya siswa. Penelitian ini bertujuan untuk menganalisis pembelajaran matematika pemecahan masalah berdasarkan budaya RIAU Melayu tentang masalah angka dua dimensi atau bentuk datar. Jenis penelitian ini adalah penelitian kualitatif deskriptif. Jenis penelitian ini dilakukan di Junior High School 1 Bunga Raya, Kabupaten Siak untuk tahun akademik 2021/2022. Hasil penelitian ini adalah analisis pembelajaran matematika "pemecahan masalah" berdasarkan budaya RIAU Melayu tentang subjek bentuk datar pada tingkat tinggi, sedang dan rendah. Persentase pada setiap level tinggi 83,8%, sedang 12,9% dan rendah 3,3%..

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INTRODUCTION

Learning mathematics "Problem Solving" relevant to the 21st century. Students need to be given problem solving in the mathematics learning process based on Riau Malay culture, this is due to train students' thinking accustomed to solving mathematical problems and preserving Riau Malay culture through the process of learning mathematics in the classroom. Learning mathematics problem solving or learning based on problems based on Riau Malay culture provides opportunities for students to explore mathematics with Riau Malay culture. The ability of students in learning mathematics consists of three domains, namely the ability to understand concepts, reasoning and communication and solving mathematical problems. The socio-cultural environment significantly influences a person's behavior (Handayani et al., 2023)

Learning mathematics *Problem Solving* and Malay culture helps students to solve math problems by knowing what is known from math problems, what to ask and how to solve math problems in their own way until they get the correct solution (Gravemeijer, 2009). In learning mathematics in class, teachers and fellow students should discuss with each other related to mathematical problems that are mathematical problem solving, the more discussions between teachers and students in learning mathematics, the students become accustomed to learning mathematics to solve more critical and creative problems (Shahbari, 2018)

The problem in learning mathematics today is that student learning outcomes are not satisfactory, this is because students do not understand mathematical concepts and problem solving (Zeynivandnezhad & Bates, 2018). Learning mathematics with students' socio-cultural environment, this can have implications for better learning outcomes. Socio-cultural interaction and learning mathematics are interrelated in learning mathematics based on Malay culture. The socio-cultural environment of students can create an atmosphere of intimacy between teachers and students in learning mathematics. The socio-cultural environment in mathematics can increase students' social interaction in learning mathematics (Tong et al., 2021)

Mathematics learning in the classroom should be linked to the local culture, this can help students understand mathematics topics with their own culture (Fauzan et al., 2018). Social interaction among students and teachers can be well established. In mathematics learning that mathematical concepts and principles can be rediscovered through problem solving that comes from facts, concepts and cultural environment (Mukuka et al., 2023). The pattern of social interaction that students understand in the cultural system can be used as an educational interaction pattern that regulates student activities during the learning process (Magyar et al., 2020).

In learning mathematics based on Malay culture can form students who have Malay cultural characters such as like deliberation, respect and tolerance (Sudarsono et al., 2022). Problems in mathematics can be in the form of questions or problems (Zulkardi, 2002). Problems in learning mathematics itself can be sourced from within mathematics (Sulistiyowati & Khotimah, 2022). Learning mathematics problem solving is associated with real life involving facts and students' socio-cultural environment.

METHOD

This type of research is descriptive qualitative. Researchers provide a description and explanation of the analysis of problem solving mathematics learning based on Riau Malay culture. This is done to find out the analysis of problem solving mathematics learning based on Riau Malay culture and to describe each answer from the research subjects. The instruments in this study were interviews, documentation, and tests. The data analysis technique used consists of three stages, namely data reduction, data presentation, and conclusion drawing. At the data reduction stage, the researcher analyzed the answers and the stages of the students in answering the questions.

RESULTS AND DISCUSSION

Syntax refers to the overall flow or sequence of teaching and learning activities. Syntax determines the types of teacher and student actions required, their sequence and tasks for students. Syntax is described in sequences of activities called phases; Each model has a different phase flow. Thus the syntax will be very helpful to carry out the teaching and learning process sequentially. The activities of each phase in the syntax of the problem solving mathematics learning model based on the Riau Malay culture are presented in the following table:

Tabel. 1. Syntax of Mathematics Learning Model Based on Problem Solving based on Riau Malay Culture

No. Stages of Learning Mathematics Based on Riau Malay Culture
1. Apperception of Riau Malay Culture <ol style="list-style-type: none"> Informing about Riau Malay culture and providing examples of Riau Malay culture with the topic of mathematics in students' daily lives on the subject of flat shapes. Creating positive perceptions in students about mathematics associated with Riau Malay culture Explaining strategies and steps for problem solving based on Riau Malay culture and dividing student study groups. d. Provide motivation for students to relate subject matter to the context of everyday life with Riau Malay culture.
2. Presenting information and problem solving with an educative pattern of Riau Malay ethnomathematics, counting and measuring activities <ol style="list-style-type: none"> Asking problems related to Riau Malay culture on each topic of learning mathematics. Ask students to understand math problems associated with Riau Malay culture individually or in groups Motivate and help students to develop problem solving plans related to Riau Malay culture Motivating students to carry out problem solving plans related to Riau Malay culture Helping students in solving math problems associated with Riau Malay culture Advise students to re-examine the results of problem solving carried out
3. Finding mathematical objects and finding new schemata <ol style="list-style-type: none"> Encouraging students to provide mathematical ideas in learning mathematics with Riau Malay culture Provide opportunities for students to investigate mathematical activities with Riau Malay culture Encourage students to find concepts from mathematical activities with Riau Malay culture
4. Presenting and developing the work <ol style="list-style-type: none"> Provide opportunities for students to present their results which are associated with Riau Malay culture Guiding students in presenting their work. Provide opportunities for other students to provide input on the work of their friends Motivate students to continue to express their ideas openly Controlling the learning process to run effectively Provide questions or input on student work Testing students' understanding with math problems associated with Riau Malay culture
5. Analyze and evaluate the results of problem solving <ol style="list-style-type: none"> Together with students, discuss the results of student work Motivating students to continue to develop their abilities in solving problems related to Riau Malay culture. Evaluating the material studied: concluding the subject matter by applying the Riau Malay culture.

Riau Malay Culture is a complex whole containing science, knowledge, belief, art, morality, laws, customs and other skills and habits acquired by humans as members of society. In this study, what is meant by Malay culture is the various creations, tastes, intentions and works of the Malay tribe in terms of 4 aspects: 1) Cultural facts: concrete objects and Malay environment that can be used as a source of mathematical problems as inspiration and abstraction of various concepts and principles in mathematics; 2) Social system: patterns of social interaction in deliberation, open-minded attitudes and patterns, mutual cooperation, happy dialogue, being honest and respecting each other; 3) Cultural

system: crystallization of the values of deliberation in making decisions, equal rights, collaboration, democracy, justice, mutual respect, courtesy, mutual assistance and mutual cooperation; and 4) Value system: the value of Malay education in the form of advice and thought patterns used in behaving, acting, working and adapting to the surrounding environment with courtesy, mutual respect, and deliberation.

Efforts to link mathematics with culture have been echoed by some mathematicians. Mathematics that is really explored based on local wisdom owned by the cultural community. In the process of learning mathematics in the apperception of learning, the teacher conveys the importance of the concept of Malay culture associated with learning mathematics, for example on the subject of flat shapes, if it is associated with Malay culture, for example regarding the unit area in the Malay language, namely; 1 depo = 1.7 meters, 1 jembo = 10 depo x 10 depo, and 1 jalur = 10 jembo, this proves that Malay culture has something to do with learning mathematics. In the process of learning mathematics, the teacher should invite students to recall the units in Malay which students themselves are close to in their daily lives, this adds to the interest of students in learning mathematics. Linking mathematics and culture in the classroom, can increase students' interest in learning mathematics with the context of students' daily lives.

Sample questions in problem solving mathematics learning based on Riau Malay culture are as follows:

Mr. Ali Atan has a rectangular banana garden with a length of 30 depots and a width of 20 depots. If 1 depot = 1.7 meters, what is the area of Mr. Ali Atan's banana plantation?

Mr. Syamsul sells a plot of land for housing in Bunga Raya District, Siak Regency with a length of 30 depots and a width of 20 depots, if 1 depot = 1.7 meters and the selling price of land for 1 depot is Rp. 150,000, what is the selling price Mr. Syamsul's land?

Mr. Bahar wants to sell land with a size of 10000 depots, if 1 jembo = 10 depots x 10 depots, and the price of 1 jumbo is Rp. 200,000, What is the selling price of Mr. Bahar's land?

Mr. Zubaer bought a square piece of land with a side size of 500 depots. If 1 depot = 1.7 meters and the price per m² of land is Rp. 250,000.00 then how much money must be paid by Mr. Zubaer to buy the land?

Try to change it in the following Malay units:

If it is known 1 depo = 1.7 meters

If 1 Jembo = 10 depo x 10 depo

If 1 jalur = 10 x 1 Jembo, then determine:

10 Depo=meter

100 Depo =.....meter

200 Depo =meter

10 Jembo =..... depo =.....meter

20 Jembo =..... depo =.....meter

100 jembo=.....depo =.....meter

200 jembo=.....depo =.....meter

22 Jalur=.....depo=.....jembo

50 jalur =.....jembo=.....depo

100 jalur =depo=jembo

10 Jalur =.....meter persegi

50 jalur =.....meter persegi

100 jalur=.....meter persegi

example of student answers

Lembar jawaban

Hal 12 1-4

1.) Diketahui : Panjang = 30 depo $30 \times 1,7 = 51,0$
 lebar 10 depo $20 \times 1,7 = 34,0$
 Jika 1 depo = 1,7 meter

Ditanya : luas persegi panjang ?
 Penyelesaian : $L = P \times l$
 $= 51,0 \times 34,0$
 $= 1.734$

Jadi, luas kebun pisang Pak Ali Atan adalah = "1.734 m"

2.) Diketahui : Panjang = 30 depo $30 \times 1,7 = 51,0$
 lebar 20 depo $20 \times 1,7 = 34,0$
 1 depo = Rp. 150.000

Ditanya : Harga jual tanah ?
 Penyelesaian : 30×20
 $= 600 \times 150.000$
 $= 90.000.000$

Jadi, harga jual tanah Pak Sumarti adalah = 90.000.000

3.) Diketahui : ukuran tanah = 10.000 depo
 1 jembo = 10 depo $\times 10$ depo
 harga 1 jembo = Rp. 200.000

Ditanya : Harga jual tanah Pak Bahar ?
 Penyelesaian : $10.000 \div 10 = 1000$ jembo
 $1000 \times 200.000 = 200.000.000$

Jadi, harga jual tanah adalah = Rp. 200.000.000

44

LKS Siswa Model Problem Solving Berbasis Budaya Melayu

Lembar jawaban

Hal 17 1

4.) Diketahui : sisi = 500 depo \rightarrow depo, 1/2 m = 250 m
 1 m

Ditanya : biaya ?
 Penyelesaian : $L = s \times s$
 $L = 250 \times 250$
 $= 62.500$

Harga = 250.000×250.000
 $= 62.500.000$

Jadi, biaya yg harus dibayar Pak Zubaer utk membeli tanah adalah = (1.800.250.000)

1.) 10 depo = 17 meter
 100 depo = 170 meter
 200 depo = 340 meter
 10 jembo = 1000 depo = 1.7000 meter
 20 jembo = 2000 depo = 3.400 meter
 100 jembo = 10.000 depo = 17.000 meter
 200 jembo = 20.000 depo = 34.000 meter
 20 jalur = 22.000 depo = 220 jembo
 50 jalur = 500 jembo = 50.000 depo
 100 jalur = 10.000 depo = 100 jembo
 10 jalur = 17.000 m persegi
 50 jalur = 85.000 m persegi
 100 jalur = 170.000 m persegi

44

LKS Siswa Model Problem Solving Berbasis Budaya Melayu

Mathematics learning model based on problem solving with the integration of Riau Malay culture is one form of ethnomatematics that emphasizes the importance of local contexts in the learning process. The cultural apperception stage carried out by the teacher helps students connect daily experiences with abstract concepts in mathematics. For example, the introduction of geometric forms in Malay songket ornaments can build a bridge between cultural reality and mathematical theory. This is in line with Ain & Lingga's research (2025) which confirms that geometric exploration of Malay songket cloth can increase the relationship of abstract concepts with cultural reality.

In addition, the use of cultural-based contextual problems, such as traditional depo, jembo, and lane size units, provides real challenges for students in honing critical thinking skills and problem solving skills. This approach is proven to encourage student creativity because they don't Only

memorize the formula, but also construct new understanding of the cultural context that is close to their lives. These results are in line with the findings of Purwastuti & Hidayat (2025) which states that ethnomatematics strengthens creativity and divergent thinking skills. The stage of finding new mathematical objects from local culture is also an important part of this learning. Culture is not only an application media, but also the source of the birth of new mathematical concepts that can be learned and developed. Priatna (2022) confirms that ethnomatematics must be positioned as a source of new knowledge formation, not just an adaptation of existing concepts. Thus, students not only study the mathematics of textbooks, but are also able to reconstruct knowledge through interactions with their own culture. Furthermore, the presentation and collaboration phase provides space for students to develop communication skills and cooperation. Process Group discussions and presentations of Riau Malay Culture-based findings make students more active, confident, and open to the ideas of their classmates. According to Wahyuni et al. (2021), collaborative -based ethnomatematics models are proven to be able to improve students' mathematical communication skills, so they not only understand concepts but are also able to convey it well to others.

Finally, the evaluation of learning carried out based on culture results in a significant affective impact. Students are more motivated, feel mathematics is no longer difficult or foreign, but rather relevant to their daily lives. Suryana (2020) shows that cultural integration in learning mathematics can increase student learning interest in elementary school. Thus, this learning model does not only have an impact on the cognitive aspects, but also on affective and social, which is very important in building a positive attitude towards mathematics..

CONCLUSION

The results of the Analysis of Mathematics Learning Problem Solving based on Riau Malay culture are the results of learning mathematics at high, medium, and low levels. As for the process of learning mathematics in solving problems at a high level of 83.8%, medium 12.9% and low 3.3%. This percentage shows that Mathematics Learning Problem Solving based on Riau Malay culture that related to students' socio-cultural environment can improve learning outcomes. Fun math learning has implications for better learning outcomes. Therefore, the teacher's ability to manage mathematics learning should be linked to the Riau Malay social culture, this can help students understand the fun of learning mathematics. In the process of learning mathematics in the classroom, it is associated with the socio-cultural environment of Riau Malay, so that the relationship between teachers and students in learning mathematics is intimate, mutual deliberation or discussion, mutual respect between teachers and students so that students are interested in learning mathematics in the context of Riau Malay culture.

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