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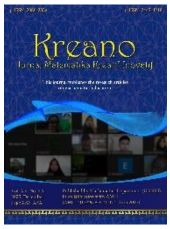

Students Perspective on How to Construct Local Cultural-Based Ethnomathematics Problem Solving

Dwi Erna Novianti [1], Zaenuri [2]*, Wardono[3], and Sugiman[4]

[1,2,3,4] Universitas Negeri Semarang, Indonesia

Correspondence should be addressed to Zaenuri: zaenuri.mipa@mail.unnes.ac.id.

Abstract

Current mathematics learning shows that problem solving often remain procedural and are not closely connected to local cultural contexts. Students generally tend to seek answers directly without going through systematic stages of problem understanding and strategy planning. The purpose of this study is to analyze the problem-solving ability of a question in the social and cultural context of local wisdom in Bojonegoro Regency. The current study was qualitative descriptive through problem-solving tests and interviews in collecting the data. The test results are then analyzed and described in relation to their problem-solving ability following Polya's steps. The respondents of this study were 6th-semester students in which they were selected using a purposive sampling technique. Two subjects were selected, namely ST (subjects chategorized with high ability) and SR (subjects with low ability). The results of the study showed that the two subject had different ways in solving the problems in a question, where ST has structured ways in solving problems compared to SR who using Polya's steps. Another finding was that students found non-mathematical information beyond the mathematical information related to the problem. This non-mathematical information refers to the stories related to local cultural wisdom that inherent in the problem. It makes learning more meaningful and provides the students with new experiences. Contextual learning that incorporated ethnomathematics elements that acts as a bridge for the students in understanding interconnection among mathematics and their daily lives. This process comes regarding the respect for cultural diversification, especially to empower the students in the area of cognitive, social, emotional, and political. Through ethnomathematics approach, students' understanding of mathematical concepts can be reconstructed effectively. Based on these findings, further research need to be conducted regarding to the develop other indicators of problem solving

Keywords: Construct; Problem Solving; Lokal Wisdom.

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Abstrak

Pembelajaran matematika saat ini menunjukkan bahwa proses pemecahan masalah masih sering bersifat prosedural dan terlepas dari konteks budaya lokal. Sebagian besar cenderung langsung mencari jawaban tanpa melalui tahapan pemahaman masalah dan perencanaan strategi secara sistematis. Tujuan dari penelitian ini adalah untuk melakukan analisis kemampuan pemecahan masalah pada soal dalam konteks sosial dan budaya kearifan lokal yang ada di kabupaten Bojonegoro. Penelitian ini merupakan penelitian deskriptif kualitatif dengan teknik pengumpulan data menggunakan tes pemecahan masalah dan wawancara. Hasil tes tersebut kemudian dianalisis dan dideskripsikan terkait dengan kemampuan pemecahan masalah dengan menggunakan langkah Polya. Subjek penelitian ini adalah mahasiswa semester 6 yang dipilih dengan menggunakan teknik purposive sampling. Terpilih dua subjek yaitu ST (subjek dengan kemampuan tinggi) dan SR (subjek dengan kemampuan rendah). Hasil penelitian menunjukkan bahwa kedua subjek memiliki perbedaan dalam menyelesaikan masalah, dimana subjek ST lebih terstruktur dalam menyelesaikan masalah dibandingkan dengan subjek SR dengan menggunakan langkah Polya. Selain itu, temuan penelitian yang lain adalah mahasiswa menemukan informasi non matematis di luar informasi matematis yang berkaitan dengan soal. Informasi non matematis yang dimaksudkan adalah cerita terkait budaya kearifan lokal yang ada pada permasalahan permaslahan. Hal ini menjadikan pembelajaran lebih bermakna dan memberikan pengalaman baru kepada mahasiswa. Pembelajaran kontekstual yang menggabungkan unsur etnomatematika berperan sebagai penghubung bagi siswa dalam memahami keterkaitan antara matematika dan kehidupan sehari-hari. Proses ini dilandasi oleh penghargaan terhadap keberagaman latar belakang budaya, yang bertujuan untuk memberdayakan mahasiswa secara kognitif, sosial, emosional, dan politis. Melalui pendekatan etnomatematika, pemahaman mahasiswa terhadap konsep-konsep matematika dapat dikonstruksi ulang dengan cara yang lebih efektif. Berdasarkan temuan ini, maka penelitian selanjutnya yag dapt dilakakan adalah mengembangkan indkator pemecahan masalah.

INTRODUCTION

The objectives of 21st-century learning are to develop skills related to communication, collaboration, critical thinking, problem-solving, creativity and innovation, compassion, and computational logic (Szabo et al., 2020). These skills are essential for students to master as part of mathematics learning objectives (Ow-Yeong et al., 2023). It is in line with mathematical problem-solving skills, which are part of 21st-century skills. Critical thinking and problem-solving are essential for students to master as a cognitive process in utilizing information, identifying, and determining problem solving strategies (Barham, 2020).

Problem solving, plays important role in mathematics learning since by having problem-solving skills, the students able to solve a problem starting from understanding the problem to finding the solution (R Riyadi, 2021). Problem solving is also a process where students use the elements of knowledge, concepts and strategies to find solutions to a problem. In the process of developing mathematical problem-solving strategies, students require careful steps or stages starting from formulating the problem, representing the problem through appropriate mathematical symbols or models (Kolar, 2021) . These steps or stages will show their understanding level and help them in applying the appropriate techniques in the problem-solving process

Meanwhile (Afnan et al., 2023) stated that by using problems related to everyday life can develop students' problem-solving skills and train to solve these problems in everyday life. Furthermore, according to (Fisher, 2021) problem-solving skills and mathematical literacy are two important and interrelated things. This connection lies in how students face problems and develop their problem-solving skills in real life. There was similar focus of discussion between problem-solving and mathematical literacy where both have the same focus on how to use mathematics as a tool to solve real-world problems. Therefore, the relationship between problem-solving skills and mathematical literacy, especially in real-world contexts needs to be analyzed deeply. Moreover, (Andari & Setianingsih, 2021) explain that problems' contexts in mathematical problem solving are very important because it is related to the concepts that had been learned by students. It makes students to be more ready in solving their life's problems. (Kolar, 2021) say that literacy does not only assess someone's ability in recognizing and understanding mathematics, it also assesses his ability in intepreting mathematics into more complex and broader contexts. It can be said that the role of context in mathematical literacy is very important.

There are four contexts of problems in mathematical based on PISA, namely personal, occupational, social, and scientific. Furthermore, it is explained that personal context is viewed from individual challenges (Almarashdi & Jarrah, 2023). Occupational context is viewed from work situations. Social context is viewed from individual's life locally, nationally, and globally. Scientific context is based on mathematics implementation in real life. According to (Bolstad, 2020), social context comes from everyday lifes by presenting individual perspective. It includes his ways to decide problems' lifes such as financial problem, economics problem, social problem, etc. It also arises from someone's daily activities. Moreover, (Umbara & Suryadi, 2019) explain that mathematical ability is focussed on human's way to use concept, knowledge, and intention in various context, including social context. This context involves changing environmental situations that cause changes in varied mathematical literacy, such as the use of cultural backgrounds.

Learning mathematics that incorporating culture in a way is called ethnomathematics. According to (Rodríguez-Nieto et al., 2025), ethnomathematics and mathematical literacy are two main ideas of mathematics. Ethnomathematics emphasizes the competence of people developed in different cultural groups in their daily lives. Furthermore, according to (Utami et al., 2021) ethnomathematics of a culture can be used as mathematical learning approach at schools. The use of ethnomathematics teaches the students to connect culture and mathematics. Several studies have been conducted related to ethnomathematics, including by (Lubis et al., 2022), which stated that local wisdom is oriented to socio-scientific issues to improve conceptual knowledge and environmental literacy. Another study conducted by (Hebebci & Usta, 2022)argued that ethnomathematics is a mathematics that grows and developsin a particular culture, which is perceived as a lens to view and understand mathematics as a cultural product.

Previous studies have consistently reported that ethnomathematics approaches are effective in supporting students' conceptual understanding and mathematical problem-solving abilities (Umbara et al., 2023). The integration of local cultural contexts in mathematics learning has been shown to positively influence students' learning outcomes and general problem solving (Prahmana et al., 2021). However, existing research has predominantly emphasized learning results, with limited discussion on the processes underlying students' problem solving. In particular, how students interpret contextual cultural information and systematically construct the steps of mathematical problem solving when engaging with ethnomathematics-based tasks has not been sufficiently explored.

The idea of ethnomathematics elaborated before shows that ethnomathematics is an approach that can be used to link culture and mathematics applied in the learning process. Furthermore, in mathematics context, cultural objects has relation to geometric shapes in mathematics (Fouze & Amit, 2023). These cultural objects can be adopted in ethnomathematics learning, especially in geometry. The problems of local wisdom presented for the students are expected to assist students in their problem-solving process. According to (Pathuddin & Nawawi, 2021)it is necessary to intensively develop and enhance students' mathematical literacy. Teachers play an important role in empowering students' mathematical experience to their real lives. Furthermore, according (Olivares et al., 2020), problem-solving is more than one way to define a problem and agrees that facing a problem means that we cannot use a previously given path, experience, or method to find the solution.

In an ideal mathematics learning environment, instruction extends beyond procedural and algorithmic proficiency to foster students' ability to develop problem solving processes that are both systematic and meaningful. In ethnomathematics based learning, such an ideal is achieved by embedding local cultural elements as problem contexts that resonate with students' lived experiences (Kabuye, 2024). Through this approach, students are guided to interpret problems contextually, determine relevant information, design suitable solution strategies, implement mathematical concepts and procedures appropriately, and engage in reflective evaluation of their solutions. Consequently, students are able to construct problem-solving steps in a structured and logical manner, framing problem solving as an integral process of meaningful mathematical reasoning rather than a purely mechanical task (Sunzuma & Maharaj, 2021).

Polya in (Barham, 2020) conducted in-depth study of the various techniques used in problem-solving and formulated four main stages: understanding the problem, planning a solution, implementing the plan, and evaluating the results. In the initial stage, students are expected to be able to understand the terms or words contained in the problem, identify the required information, restate the problem in their own words, imagine the illustrations or diagrams that can aid in understanding, and ensure that the available information is sufficient to find a solution. Finally, in the "solution planning" stage, students have to choose the appropriate approach to solve the problem.

Meanwhile, according to (Fisher, 2021) there are several stages that can be used as guidelines in assessing students' problem-solving ability. The ones that widely used is the four stages of problem-solving approach proposed by Polya. The first stage is understanding the problem, where the students need to understand of given situation, identify information, and what required to be solved. The second stage involves developing a plan, where students are expected to separate relevant variables, construct a mathematical model, determine a strategy or solution method, and design the steps to be taken. In the third stage, students implement the plan by carry out the calculations or steps that have been designed. The final stage is re-evaluating the results obtained by reviewing and testing the solutions found to ensure their validity.

Based on the above situation, ethnomathematics problem-solving based on local wisdom is the area that can be studied more to understand the problem-solving process. Based on this explanation, the purpose of this research is to analyze the construction of mathematical problem-solving steps using ethnomathematics problems based on local wisdom. The problems presented are the result of an exploration of local wisdom found in Bojonegoro Regency.

Although this ideal condition has been extensively discussed in theoretical studies, classroom practices in mathematics learning indicate that problem-solving activities are still largely procedural and weakly connected to local cultural contexts. Students tend to emphasize obtaining correct final answers rather than engaging in systematic processes of understanding problems and planning solution strategies. Moreover, prior research has mainly evaluated the effectiveness of instruction based on learning outcomes or quantitative improvements, while limited attention has been given to exploring how students perceive, interpret, and construct problem-solving steps when dealing with tasks embedded in local cultural contexts. This gap between the ideal framework and actual instructional practice clearly indicates the need for further investigation.

METHOD

This research is a qualitative descriptive study using a case study design. The respondents were sixth-semester students in East Java. Respondents were randomly selected using a purposive sampling method, among students who taking algebra courses. Two respondents were selected: those with high scores, denoted as ST, and those with low scores, denoted as SR. Data collection was conducted by administering a mathematics problem-solving test related to issues in a social and cultural context. Based on the result of the test, respondents were selected for in-depth interviews. The test results addressed issues in a sociocultural context then analyzed and their problem-solving abilities were described using Polya's steps.

This study employed a descriptive qualitative approach using a case study design. The descriptive qualitative approach was selected to provide an in-depth portrayal of students' mathematical problem-solving processes, particularly in how they construct problem-solving steps within social and cultural contexts.The research subjects were sixth-semester undergraduate students from a university in East Java who were enrolled in an algebra course. The subjects were selected using purposive sampling based on their academic achievement. To represent variations in mathematical problem-solving characteristics, two subjects were chosen: one with high academic achievement (ST) and one with low academic achievement (SR). This selection was intended to capture diverse patterns in the construction of students' mathematical problem-solving processes.

Data Collection

Data collection was conducted by administering a mathematics test related to problems in a cultural context or ethnomathematics problems to all respondents. Respondents were then selected for interviews. The researcher, acting as the primary instrument, observing students' activities while completing the test. The researcher then interviewing the selected respondents. In the current study, data obtained from the test results were used to select respondents for in-depth interviews to analyze the construction of the steps taken to solve the ethnomathematics problems.

Data collection was carried out by administering a mathematical problem-solving test developed within a local social and cultural context. Based on the results of the test, selected subjects were subsequently involved in in-depth interviews to gain deeper insights into their processes of understanding the problems, formulating solution strategies, and constructing solutions. The collected data were then examined using Polya's problem-solving framework, which comprises four stages: understanding the problem, devising a plan, implementing the plan, and reflecting on the resulting solution. The test instrument employed in this study was an ethnomathematics-based mathematical problem-solving assessment developed using a local social and cultural context. The assessment consisted of open ended items that enabled students to articulate their reasoning processes and problem-solving strategies in written form. The indicators of problem-solving assessed in the test were aligned with Polya's problem-solving stages. In addition, a semi-structured interview guide was used as the interview instrument. The interviews were conducted to obtain an in-depth understanding of students' cognitive processes in constructing ethnomathematics-based problem-solving steps, including their rational for selecting particular strategies, their interpretation of cultural contexts, and the challenges encountered during the problem-solving process. Instrument validation was carried out through content validity involving two experts, namely a mathematics education expert and an expert in ethnomathematics-based learning. This validation process aimed to evaluate the suitability of the cultural context, the clarity of the language used, the relevance of the problem-solving indicators, and the consistency between the test items and the research objectives.

Data Analysis

In this study, to determine the construction of problem-solving steps using Polya's stages, we analyzed the respondents' responses, starting by understanding the problem, planning the solve, implementing the solution plan, and reviewing the result. These stages were conducted by analyzing each selected subject through in-depth interviews. Based on the interview conducted, the construction of the problem-solving steps, in this case using ethnomathematics problems, is described.

Data analysis in this study was conducted qualitatively using the interactive analysis framework proposed by Miles and Huberman, which encompasses data reduction, data display, and conclusion drawing with verification. The analytical process was performed concurrently from the data collection phase until conclusions were formulated. In the data reduction stage, the researcher identified, selected, and concentrated on data obtained from the problem-solving test and interview transcripts that were relevant to the research objectives. The reduced data were then organized according to Polya's problem-solving indicators, including understanding the problem, planning a strategy, implementing the solution, and reflecting on the results.

At the data display stage, the analyzed data were systematically arranged in the form of descriptive narratives derived from students' written responses and interview findings. This presentation facilitated the examination of relationships among data and the identification of patterns characterizing ethnomathematics-based problem-solving processes. Subsequently, conclusion drawing and verification were conducted by reviewing recurring patterns that emerged from the displayed data. Conclusions were refined through continuous comparison between test results and interview data to ensure the consistency and credibility of the findings related to students' construction of problem-solving steps.

RESULT AND DISCUSSION

Results

In this study, the results of a problem-solving test in a cultural context related to students' problem solving abilities were described using Polya's steps. The problem-solving questions used were socio-cultural problems based on the exploration of the local wisdom of Kayangan Api.

Kayangan Api in an Eternal flame phenomenon tourist destination featuring an eternal, unquenchable flame located in a protected forest area in Sendangharjo Village, Ngasem District, Bojonegoro Regency, East Java. Around the fire source at the Kayangan Api tourist attraction are four small gates. These gates have tiered, square-shaped roofs, as shown in the picture. The roof dimensions on each tier differ by 10 cm on each side. The lowest side of the roof is 1 meter.

Figure 1

Figure 2

a. *Create a pattern of rows along one side of the entire roof!*
b. *What is the total length for one side of the roof?*

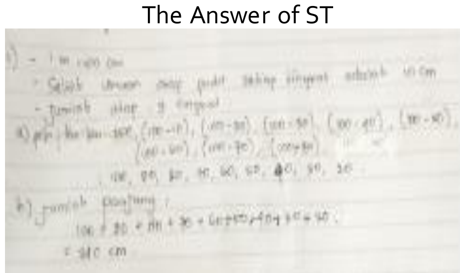
Figure 1. The Problem-Solving Questions used Were Socio-Cultural Problems

The example problem provided is expected to explore students' problem-solving competencies. The images and stories provided will provide new information related to the cultural context. When understanding the problem, students are expected to use their reasoning skills to interpret the pattern as asked in the problem, thus enable them to solve the problem.

The following are the answers from ST and SR to regarding the given problem can be seen in Figure 2.

b) Formula for the total length of one side
$S_n = n/2\,(A + U_n)$
$S_9 = 9/2\,(20 + 100)$
$S_9 = 4.5 \times 120$
$S_9 = 540$ cm = 5.4 m
Answer of SR
Problem Description : 1 meter = 100 cm,
The decrease in length at each step is 10 cm,
Total number of steps = 9 levels
Determine the Length Pattern
Steps: (100 → 90), (100 → 80), (100 → 70), (100 → 60), (100 → 50), (100 → 40), (100 → 30), (100 → 20)
Sequence: 100, 90, 80, 70, 60, 50, 40, 30, 20
Total Length : 100 + 90 + 80 + 70 + 60 + 50 + 40 + 30 + 20 = 540 cm
So, the total length is 540 cm.

The Answer of ST



Determine the pattern of length on one side.
Given:
U_1 = 1 meter = 100 cm
b = 10 cm
Formula: $U_9 = a + (n - 1)b$
$100 = a + (9 - 1)10$
$100 = a + 8 \times 10$
$100 = a + 80$
Therefore, a = 20
Thus, the sequence is: 20, 30, 40, 50, 60, 70, 80, 90, 100

The Answer of SR

Figure 2. Answer of ST and SR2

Based on the answers from those two respondents, the researchers then explored these responses by conducting interviews to gather relevant information. The following is an excerpt from an unstructured interview with ST and SR regarding the first steps taken with Polya.

R	:	*How the way you understand this question?*
ST	:	*I read the questions carefully, including the story elabotaed in the questions.*
R	:	*What about you?*
SR	:	*I also read the question.*
R	:	*After reading the question completely, what do you do?*
ST	:	*I wrote down the information on the question, including the dimensions.*
SR	:	*I only wrote the size but didn't read the whole things.*
P	:	*How many times have you read this question?.*
ST	:	*Twist.*
SR	:	*Once.*

In the first Polya step, understanding the problem, ST read carefully and thoroughly so that they could fully understand the information in the question. Meanwhile, SR did not read the question in its entirety then tried to understand the question but incomplete. This can be seen from the answers written by both respondents. ST wrote completely what was known from the question based on the information that ST previously written. Meanwhile, SR wrote from the information known based on what he understood, but there were still some incompleteness. In general, both respondents were able to understand the problem even though the written answer was incomplete. However, after an in-depth interview, both respondents were able to explain what was known in the question. Especially subject SR, although the written answer was incomplete, subject SR was able to explain what was known completely using the available information.

The following is a further interview excerpt regarding Polya's second step, namely planning a resolution.

R	:	*Okay, based on the information you've gathered and explained, what did you do then?*
SR	:	*I immediately created an answer of the question.*
ST	:	*I looked at what I'd written earlier, then I thought about how to solve it, using what formula. Then, from that question, I discovered that it falls under the concept of sequences and series.*
R	:	*Can you explain how to create an answer or solution?*
SR	:	*Based on what I know, I then created an answer to the question.*
R	:	*How did you create the answer?*
SR	:	*I looked at the question, and I immediately solved what was asked.*

Based on the intreview excerpt, it can be obtained information that ST is better at developing plans by firstly considering the suitability between the question and the formula or material to be used. ST firstly develop a solution plan as written in subject ST's answer. during the interview process SR explained that in solving the question, directly creates the answer by looking at what is asked without making a plan. This is an evident that SR answer it by directly writes the answer even though the answer written is correct. The researcher then looked at the answer written by SR which contained errors in solving the question. These errors are likely caused by SR is not develop a plan in advance to solve the question. After digging deeper, it was found that SR was unstructured in making the solution, because there was no prior planning.

The third step of Polya is implementing the solution plan. the researcher continued the interview process to gather relevant information. The following is an excerpt from the interviews with the two respondents.

R	:	*Based on the previous steps, what did you do then?*
ST	:	*I plugged the numbers that I known into the appropriate formula, which is a sequence or series.*
SR	:	*I used a method that I known to find the solution.*
R	:	*What formula or method did you used?*
ST	:	*I used a number pattern by listing the lengths of one side at each level, then I usedthe concept of arithmetic sequences.*
SR	:	*I also created a pattern, but I didn't use the sequence or series formula. I added them directly.*

From the interview excerpt, it was obtained that there were differences between the two respondents in solving the problem. ST understood the concept of the material used to solve the problem using the concept of sequences and series. Therefore, ST used the formula for the sum of the nth term (*Sn*) in the material on arithmetic sequences and series to find the solution. This is evident from the answer written by ST. Meanwhile, SR did not use the concept of sequences and series in solving the problem. SR used a pattern to solve but did not use the formula for the sum of the nth term (*Sn*) in the material on arithmetic sequences and series to find the solution. This is was caused SR made errors in doing the problem given.

The final step in Polya is reviewing the answers obtained. To gather information, researchers conducted interviews related to the Polya steps. The following is the interview excerpts:

R	:	*Okay, next I'd like to know whether both of you checked your answer after finding it?*
ST	:	*Yes, I checked it using the nth term formula, and it turns out the pattern I created was correct.*
SR	:	*I didn't double-checked it, but I thought my answer was correct because I added all the numbers.*
R	:	*Then, regarding the SR question, where do you think your answer went wrong?*
SR	:	*I added it straight away, wasn't thorough, and didn't confirming by doing double-check.*
R	:	*Okay, thank you. So, what did you gained after solving the problem?*
SR	:	*I gained information about the Kayangan Api tourist attraction.*
ST	:	*Yes, I also gained information about the tourist attraction, as well as the data for the problem.*

The interview excerpt shows that ST double-checked what he had done to solve the problem. Meanwhile, SR did not double-checked his answer. SR thought he had already had the correct answer to solve the problem. This led to errors in SR's answer. However, there is an interesting aspect of the interview: both respondents reported that in addition to obtaining information regarding the size of the building's roof, they also obtained information regarding the Kayangan Api tourist attraction.

Discussion

Based on the results of the both respondents responses and further information gathered through interviews, the conclusions wre drawn: 1) Both respondents, understood the given problem. ST and SR understood what was known and what was asked in the problem. 2) ST had a good plan for solving the problem and then executed that plan effectively and also understood the relevant concepts, in this case, the concepts of sequences and arithmetic series, which would be used to find the solution. However, SR did not make a plan for solving the problem. SR directly performs additional operations in finding solutions and does not use appropriate mathematical concepts, so there are errors in the answers given, and 3) Both respindents got non mathematical information related to the tourism and cultural contexts that exist in the problem about Kayangan Api. in addition to understanding the problem mathematically, the respondents also gets new information about local culture. 4) the use of everyday life problems using social and cultural contexts provides a new learning experience for students by obtaining new things or information. Ethnomathematics approach provides a strong contextual foundation for supporting the construction of mathematical problem solving processes (Prahmana & D'Ambrosio, 2020). Recent studies indicate that local cultural contexts facilitate the connection between students' everyday experiences and formal mathematical concepts, thereby strengthening conceptual understanding and mathematical reasoning (Rosa & Orey, 2021) The integration of cultural contexts also encourages students to interpret problems more holistically, grounded in the social realities familiar to them.

According to(Kenedi et al., 2019) who demonstrates that in the process and activities involved in solving mathematical problems, students are indirectly develop their ability to connect the knowledge and concepts to find solutions. These connections will be relevant to solving real-life problems. Meanwhile, according to (Islami et al., 2022) problem-solving is crucial not only for those who studying mathematics but also for its application to other fields of study in their daily lives. Students are required to develop problem-solving skills to address both basic and complex mathematical problems encountered in everyday life. When discussing problem-solving skills, several experts have discussed the steps of problem solving, one of them is Polya's steps. Polya defines four steps in understanding problem-solving skills. According to (Barham, 2020), Polya's four steps are 1) understanding the problem, 2) making a plan, 3) implementing the plan, and 4) reviewing the solution obtained. Further explanations regarding Polya's steps (Fisher, 2021) and (Anjariyah et al., 2022) explain that Polya's first step is to understand the problem, where students are expected to be able to understand the problem and then be able to identify the information contained in the question related to what is known and asked from the given problem. The second step is to determine a plan for solving the problem, in which students are able to determine the concepts relevant to the problem, create a mathematical model, and write down the steps used in solving the problem. The third step is to implement the plan from the previous step, in which students are able to carry out the plan for solving the problem using mathematical calculations. The final step is to re-examine the solution obtained by looking at the initial problem given.

Regarding the differences in solving the problems, according to (Simamora et al., 2018) it is stated that students are chategorized as those who had problem-solving skills if the student can understand the problem, create a strategy then implement the strategy made and re-examine the results of the problem solving carried out. In addition, students can develop other ways to get solutions to mathematical problems. It is in line with (Tambunan, 2019) who stated that mathematics learning that uses problem-solving strategies indirectly affects students' skills in solving problems, students' academic achievement and the level of student achievement itself when using problem-solving strategies compared to those using conventional learning.

The use of contextual problem also influences students' ability to understand mathematics problems. According to (Cai & Hwang, 2020) problem-solving has various meanings depends on the context used. However, the important point is on how the teachers construct useful, meaningful, and relevant problems to support studnets' problem-solving abilities. Mathematics learning that uses real-life contexts enhance the students to discover the relationship between concepts. The use of problems in local cultural contexts will also help students better understanding the development of mathematics from the perspective of their experiences in everyday life (Noviarsyh Dasaprawira et al., 2019). Furthermore, it is explained that the use of this local cultural context can be used to change habits in giving routine problems to more varied questions. In addition, according to (Sutaphan & Yuenyong, 2019) explains that the use of cultural dimensions in learning enable the students to connect existing knowledge so that relationships are formed between real-world problems and everyday experiences..

The results of this study also show that in the mathematics learning process, students are not only taught mathematical concepts but also honed their mathematical skills. According to (Purnomo et al., 2022) several other abilities that are also developed includes creative thinking skills, mathematical connections, and mathematical communication. According to the research conducted by (Widada et al., 2019) students' mathematical problem-solving abilities increased after they were participated in ethnomathematics learning through an outdoor activities approach, compared to before the learning was implemented. This finding is in line with the results of previous research (Rosa & Gavarrete, 2017) which showed that students' who received material-oriented through ethnomathematics-based learning was higher than students who learned using non-ethnomathematics materials by considering students' initial abilities.

Contextual learning that integrates ethnomathematics provides a bridge for students to understand how mathematics relates to their daily lives. This learning process respect to the diversity of cultural experiences, thus empowering students intellectually, socially, emotionally, and politically. Through ethnomathematics, students' understanding of mathematical concepts effectively redirected, regardless of their current level of thinking development (Nur et al., 2020). Students also become more confident in using their own chosen methods and demonstrate respect for local culture. This approach enriches problem-solving strategies and helps students gain meaningful understanding of mathematics. Providing challenging and curiosity-provoking tasks is an effective way to observe how students think and increase their interest in learning mathematics (Liljedahl et al., 2016). The importance of mathematics learning provides a strong foundation for maintaining and improving students' thinking skills to a higher level.

From a pedagogical, the integration of social and cultural contexts in learning can enhance students' cognitive engagement. Previous studies indicate that culture-based problems promote more diverse problem-solving strategies than routine tasks and support the development of reflective and metacognitive abilities in mathematical problem solving (Malangtupthong, 2022)

. Building on these findings, the present study contributes to the literature by offering a detailed examination of students' construction of mathematical problem-solving steps within local cultural contexts, thereby extending research on problem-solving processes and ethnomathematics-based instruction.

Implication of Research

This study found that students had a new experience in learning mathematics, gaining information beyond the mathematical information contained in the problem. During the problem understanding stage, students acquired non-mathematical information related to local cultural stories in their region. Based on these findings, further research need to be conducted regarding to the develop other indicators of problem-solving.

Limitation

This research is limited to the local socio-cultural context in Bojonegoro Regency. Then. the research subject is also limited to one of the collages in Bojonegoro.

This study is subject to several limitations. First, the research was conducted within a specific local socio-cultural context, namely the cultural setting of Bojonegoro Regency. The ethnomathematics problems used in this study were derived from cultural practices and social contexts familiar to students in this region. Consequently, the findings cannot be directly generalized to other cultural contexts with different social and cultural characteristics. Second, the research subjects were limited to undergraduate students from one university in Bojonegoro Regency. This relatively narrow participant scope may not fully represent the diversity of students' mathematical problem-solving processes in other higher education institutions or regions. Third, the data collection techniques were limited to written problem-solving tests and in-depth interviews. Although these methods allowed for an in-depth exploration of students' problem-solving processes, this study did not include classroom observations or longitudinal data collection.

CONCLUSION

Based on the research results and discussion in the previous section, it can be concluded that solving mathematics problems involves a problem-solving process. Problem-solving plays a role in developing students' abilities in several areas, including reasoning, interpreting, and solving problems. Using a local cultural context that is close to students' daily lives will positively impact their problem-solving abilities. Based on the research findings and discussion, it can be concluded that mathematical problem solving is understood as a cognitive process involving the activities of understanding problems, interpreting contexts, planning strategies, and systematically constructing solutions. Students' engagement in this problem-solving process plays a significant role in developing mathematical thinking abilities, particularly in reasoning, interpretation, and the resolution of mathematical problems grounded in local cultural contexts. Students will easily understand the problems because it is related to real life. Furthermore, by using a real-life and local culture context, students will have different experiences, meaningful learning experiences, and new experiences. Students will gain mathematical and non-mathematical information from the problems presented.

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