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Analysis of Strategies and Student Creativity in Solving Mathematical Literacy Problems in Learning Adaptation to New Habits of Junior High School Students

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Abstract
This study aims to analyze strategies and creativity in solving mathematical literacy problems in grade VIII students of SMP Negeri 3 Sungguminasa, Gowa Regency. The type of research used is qualitative with a descriptive approach. The subjects in this study were a minimum of 6 class VIII students, a minimum of 2 high category students, two medium category students, and two low category students. The instruments used in this study were two items mathematical literacy problem-solving tests and interview guidelines. The data analysis techniques used are the Miles and Huberman model, which consists of data condensation, data presentation, and conclusion. The results of this study showed that high-category subjects were able to use more than one strategy in problem-solving. High-category subjects meet the indicators of creativity, namely fluency, flexibility, and novelty. So, high-category subjects are at a creative level. The subject of the medium category uses only one appropriate strategy in problem-solving. The subject of the medium category can meet the indicator of creativity, namely fluency, so the subject of the medium category is less creative. Whereas subjects in the low sort use only one strategy in problem-solving, the strategy is inefficient with the available problems. Low-category subjects cannot meet the indicators of creativity, so the subject is at a non-creative level. Therefore, there are differences in students' strategies and creativity in solving mathematical literacy problems in class VIII of SMP Negeri 3 Sungguminasa, Gowa Regency.

Keywords: *Analysis; strategy; creativity; problem-solving; mathematical literacy.*

INTRODUCTION

The Covid-19 pandemic has caused the Indonesian education world to require special attention. Current government regulations eliminate face-to-face learning, so online learning is the only solution that can be taken. Learning activities at home are a new challenge for teachers and students. By utilizing increasingly advanced science and technology, educators are expected to increase their creativity and make innovations to support online learning, especially mathematics. Mathematics is essential in human life because it is needed anytime and anywhere.

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According to (Maharani & Bernard, 2018), mathematics subjects need to be given to all students, starting from elementary school to higher school levels, to equip students with the ability to think logically, systematically, analytically, critically, and creatively, as well as the ability to work together. One of the demands of the 2013 curriculum requires students to master the meaning of solving mathematical literacy problems and wants students not only to be able to solve routine problems using formulas/algorithms but also to be able to reason and use mathematics to solve problems in life.

However, the ability to solve mathematical problems in Indonesia is still deficient, especially in solving mathematical literacy problems. This can be seen in the 2018 Programme for International Student Assessment (PISA) study report. According to (Schleicher 2018), Indonesia 2018 was ranked 74th out of 79 PISA participating countries in the reading ability category; in the mathematics ability category, Indonesia was ranked 73rd out of 79 PISA participating countries, while in the science ability category, Indonesia was ranked 71st out of 79 PISA participating countries. This indicates that education in Indonesia has not been able to develop solutions to students' mathematical literacy problems.

The problems in mathematics are diverse, so several strategies are needed to solve them. When problem-solving, the strategy used by students is expected to be helpful in their real lives. These namely strategies can make it easier for students to understand the problem and get an overview of problem-solving.

According to (Shadiq, 2004), problem-solving strategies are ways that people often use and often succeed in problem-solving. According to (Sutriningsih, 2015), students are directed to a systematic understanding of concepts applied in solving a problem through mathematical problem-solving strategies. Thus problem-solving strategies have an impact on students to continue to develop systematic thinking habits and get used to the level of cognitive aspects of students to improve students ability to solve a problem.

In solving diverse problems, students need to develop a strategy. According to Polya (Shadiq, 2004), there are several strategies that students can apply, including 1) trying, 2) making drawings or diagrams, 3) trying on more straightforward questions, 4) making tables, 5) finding patterns, 6) breaking down goals, 7) taking into account every possibility, 8) thinking logically, 9) moving from behind, and 10) ignoring the impossible. These strategies are needed so students can solve the problems presented more efficiently.

According to (Aisyah & Santoso, 2019), some things that trigger students' low ability to solve problems are due to improper strategy determination. According to (Darmawan & Prayekti, 2019), the determination of the use of strategies in solving mathematical problems carried out by students is caused by several factors, including because these strategies are the strategies that are most often explained and used by teachers when carrying out learning in the classroom In addition to the selection of the proper strategy success in solving a problem is also greatly influenced by the creativity possessed by students.

According to (Subur, 2016), creativity, as the ability to see possibilities to solve a problem, is a form of thinking that, until now, is still lacking attention in formal education. So it can be underlined that creativity is essential thing in learning mathematics Orton (1992) mentioned that the challenging and complicated stages are stage 2 (determining the problem-solving plan) and stage 3 (working on),

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especially the second stage, where creativity, strength, and deep understanding are indispensable. Based on this opinion, creativity is essential, especially in planning problem-solving. Creativity also plays a significant role when students choose strategies to solve problems.

Based on the presentation above, this study examines the analysis of strategies and creativity possessed by students in solving mathematical literacy problems. Therefore, the researcher took the initiative to conduct a study titled "Strategy Analysis & Creativity of students in Solving Mathematical Literacy Problems in Class VIII of SMP Negeri 3 Sungguminasa, Gowa Regency".

The research results (Siswono, 2011) with the title "Level of student's creative thinking in classroom mathematics." This study has described the characteristics of students' creative thinking levels. The difference in the level is based on smoothness, flexibility, and novelty in solving and posing mathematical problems. Students at level 4 meet the three creative components of thinking indicators; level 3 meets two components, flexibility and smoothness, or novelty and smoothness. Students at level 2 only meet one aspect, namely flexibility or novelty, and level 1 only meet the aspect of fluency. Students at level 0 do not meet all the components.

Based on the research above, there is a relationship between the selection of strategies that will be used by students in solving mathematical literacy problems with the creativity of students. This study aims to discover students' strategies and creativity in solving mathematical literacy problems in class VIII of SMP Negeri 3 Sungguminasa, Gowa Regency.

METHOD

This qualitative research uses a descriptive approach that aims to describe students' strategies and creativity in solving mathematical literacy problems in learning to adapt to new habits. This research was conducted at SMPN 3 Sungguminasa, Gowa Regency.

The instruments used in carrying out the research are the main instruments in this study are the researchers themselves, who have a role as planners, data collectors, data analyzers, and whistleblowers in researching mathematical literacy problem-solving tests, interview guidelines, and validation sheets as supporting instruments.

The analysis of the validity of the content is carried out by expert validators or experts in the field of measurement to provide an assessment and consideration regarding the points of the statement of the instrument that the researcher has made. The relevance of expert validators as a whole can be calculated using Gregory's formula (Ruslan, 2009) as follows:

$$Content\ validation = \frac{D}{A + B + C + D}$$

From the results of content validation of research instruments, both mathematical literacy problem-solving tests and interview guidelines, the data were obtained as follows:

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Table 1. Summary of Expert Validation Results of Research Instruments

Instrument	Validation Coeff.	Description
Mathematical Literacy Problem Solving Test	1	Valid
Interview guidelines	1	Valid

The method of data collection is carried out using time triangulation. The data analysis techniques carried out in this study consist of three: data analysis of the results of solving mathematical literacy problems and analysis of interview data.

RESULT AND DISCUSSION

Table 2. The selected research subjects

No	Subject Initials	Category	Code
1	KMS	High	KMS-KT
2	R	Medium	R-KS
3	NAY	Low	NAY-KR

The following is an explanation of the data on the mathematical literacy problem-solving test, and the interview results are presented as follows:

a) Data exposure and data validity strategy and creativity KMS-KT Subjects on question number 1

Answer to question number 1 how to solve one subject KMS-KT

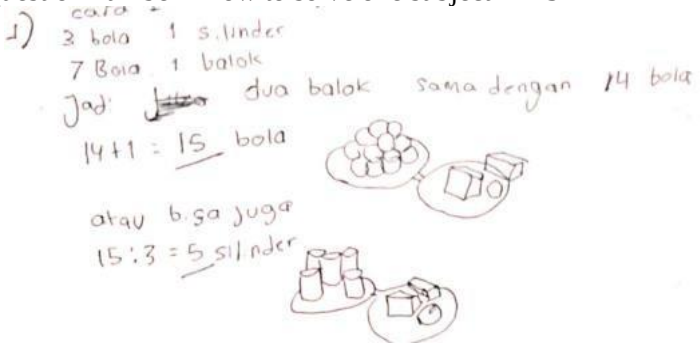

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Figure 1 KMS-KT Subject Answer question number 1 how to solve 1
Answer to question number 1 how to solve two subjects KMS-KT

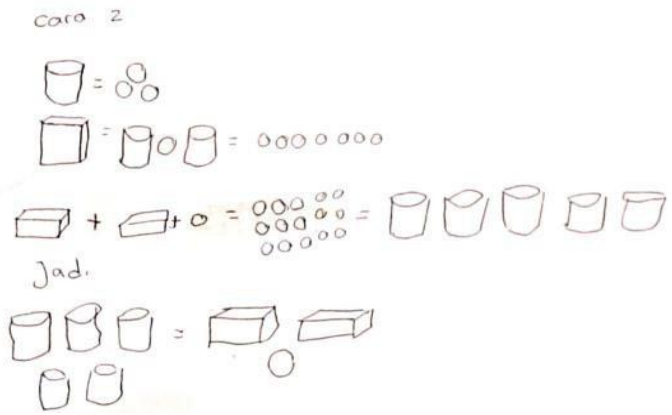

Figure 2 KMS-KT Subject Answer to question number 1 how to solve 2

Based on the data above, the subject only gave answers to each written question. Therefore the researcher dug it up through interviews. The following is the presentation of data from the interview results of the mathematical literacy test of KMS-KT subjects:

P : pernah? Sudah pernah ketemu soal seperti ini ?
S. : iya
P : ini jawabannya pernah ditemukan di internet ?
S : tidak pernah
P : berarti ini jawaban dari pemikiran anda sendiri ?
S : iya
P : berdasarkan soalnya ?
S : iya

Based on the above exposure, it can be seen that the interview results correspond to the written answers of the KMS-KT subject. The subject found two correct answers in solving question 1, namely, 15 balls and five tubes. So that the subject can be said to be fluent in doing the questions. The subject of KMS-KT is also able to show different ways of solving. This shows that the subject is flexible in answering questions. It can be seen from the subject's answer that KMS-KT can answer with a logical thinking strategy (S7) and make an image (S2). Based on the results of interviews with the subjects of the two settlements, they have never been found in textbooks or on the internet. Then the subject of KMS-KT contains aspects of novelty (novelty).

So from the results of the tests and interviews conducted, the strategies used by students are obtained, namely thinking logically and making pictures. The indicators of creativity that are filled are fluency, flexibility, novelty

Data exposure and validity of strategy data and creativity R-KS subjects on question number 1

The following is explained the results of completing the R-KS subject test in question no. 1:

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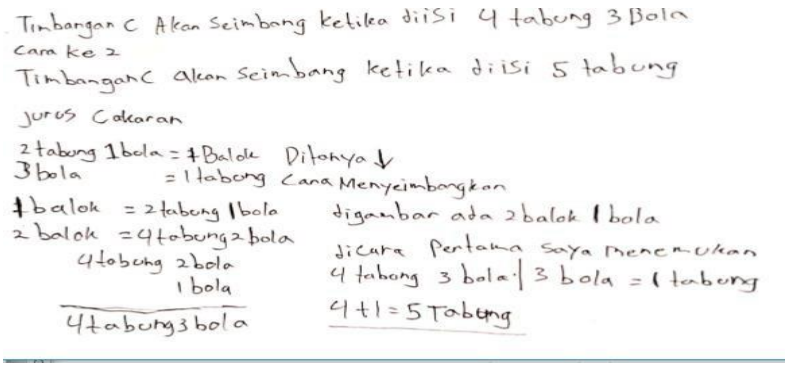

Figure 3 R-KS subject answer to question number 1

Based on the data above, R-KS only provides answers to written questions. Therefore researchers dug it up through interviews. The following is the presentation of data from the interview results of R-KS subjects:

P : apakah pernah ki ketemu dengan soal seperti ini ?
S : belum. baru
P : bisa dijelaskan apa yang muncul dipikiran ta pas anda lihat soalnya?
S : ku pahami dulu rumusnya. Kenapa bisa didapat balok, kenapa bisa dapat silinder. Kukasi begitu dulu.
P : apakah pernah kita gunakan cara ini ketika menjawab soal yang lain?
S : belum pernah.

Based on the above presentation, it can be seen that the interview results follow the written answers of the subject R-KS. The subject of R-KS found two answers in solving question 1: four tubes of 3 balls and five tubes. So that the subject of R-KS can be said to be fluent in doing the problem. The strategy used in completing the mathematical literacy test is logical thinking (S8). In addition, based on the interview results, R-KS subjects can solve the problem in a new, used way. This proves novelty. So from the results of the tests and interviews conducted, the strategy students use is logical thinking. The indicators of creativity that are filled are fluency and novelty.

Data exposure and validity of data strategy and creativity of NAY-KR Subjects in question number 1

The following are presented the results of completing the NAY-KR subject test.

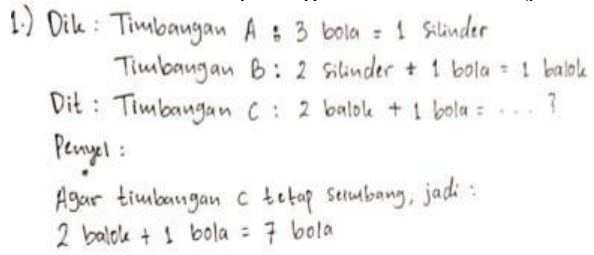

Figure 4 NAY-KR Subject Answer to question number 1

Based on the data above, the subject only gave answers to each written question. Therefore the researcher explored it through interviews. The following is the presentation of data from the interview results of the mathematical literacy test of the NAY-KR subject:

P : terus apakah cara ini pernah digunakan sebelumnya atau pernah ketemu dengan soal ini sebelumnya ?
S :tidak kak
P :oh belum pernah… jadi Ini pertama kali terus cara ini juga anda baru pertama kali anda gunakan atau sudah pernah anda pernah kan ?

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S : baru pertama kali
P : oke.. apakah masih ada cara lain untuk soal no 1 ?? S : tidak ada kak
P : terus jawaban-jawaban yang anda tuliskan ini pernah terpikirkan atau ditemukan di buku atau di internet?
S : tidak
P : oke .. apakah ada kesulitan dalam menyelesaikan soal ini ?
S : sedikit kak
P : oh sedikit kesulitan

Based on the above presentation, it can be seen that the interview results follow the NAY-KR subject has written answers. In solving question number 1, the subject of NAY-KR only solves with one strategy, namely logical thinking (S7), to produce an answer of 7 balls. Based on the interview results, the subject NAY-KR did not understand question number 1 because it was the first time to meet with a question like this. As seenin Table 3 related to a matrix of students' strategies and creativity in solving mathematical literacy problems.

Table 3. Matrix of Strategies and Student Creativity in Solving Mathematical Literacy Problems

	High	**Moderate**	**Low**
Strategy	Think logically, create images, find patterns, create tables	Think logically, create images, Find patterns	Thinking logically, making pictures, ignoring the impossible
Creativity	*Fluency* *Flexibility* *Novelty*	*Fluency* and *novelty* *Flexibility* and *novelty*	It does not contain creativity indicators
Conclusion	Creative	Quite creative	Not creative

CONCLUSIONS AND SUGGESTIONS

Based on the analysis and discussion results, it can be concluded that the subject has a PCK component of KCS or content knowledge. Students in fractional numbers have the concept of *part-whole* relations consisting of an area model, a measurement model, and a discrete set model through two (2) subcomponents based on the subcomponents of KCS Usman (2013), namely 1) teacher's knowledge of student ideas concerning the topic of the overall part of the fractional number and 2) p the teacher's knowledge of the conception and misconceptions of students on the topic of the *whole-part* of fractional numbers.

The certified mathematics teacher's subject-01 has an overall PCK component of the KCS against the fractional number of the concept of a *part-whole* relation consisting of an area model, a measurement model, and a set model. Subject non-certified mathematics teacher subject-02 has overall PCK components of KCS but is limited. This can be seen in the fractional number model; the KCS owned is still limited to all indicators. Based on the findings of the two subjects, the KCS of mathematics teachers certified in subject-01 is better than the KCS of non-certified mathematics teachers in subject-02.

The results of this study are expected to be a recommendation for teachers, in general, to pay attention to the PCK component of KCS or teacher knowledge of content and students, especially mathematics teachers. As a professional teacher, it is inseparable from the PCK that it must be owned so that teachers are expected to have an overall component in PCK consisting of KCT and KCS. Teacher Certification provides an overview of having a KCS as a whole. However, some parts still need to be owned so that it becomes a consideration to teachers who have not been certified that teacher certification is essential for KCS.

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