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Students' Creativity in Solving Ill Structured Problem Context Calorie Intake

Helen Novi Antika[1], Tika Anjasari[2], Ahmad Wachidul Kohar[3]

[1,2,3] Universitas Negeri Surabaya, Kampus Ketintang Surabaya 60231, Indonesia
Email: helennovi.20018@mhs.unesa.ac.id

Abstract

In math learning, creative thinking is very important because it allows broad thinking to find new solutions to problems. This study aims to describe the level of students' creative thinking in solving ill-structured problems in the context of calorie intake. This type of research was descriptive with a qualitative approach. Researchers chose three students in class VIII with different mathematical abilities (high, medium, and low) based on their value as research subjects. To collect data, researchers used ill-structured problem tests and interviews. The data were analyzed based on the level of students' creative thinking and follow-up interviews. The results showed that in aspect fluency, S1 and S2 could give two correct answers, while S3 only gave one correct answer. Aspects of flexibility: S1 and S2 can provide alternative answers using different mathematical concepts, while S3 only provides one way of providing alternative answers. Aspects of originality: S1 can provide two unique solutions, while S2 and S3 produce ordinary solutions. Based on this, S1 is included in level 4 (very creative), S2 is included in level 3 (creative), and S3 is included in level 0 (not creative). Based on the results of this study, designed learning must stimulate students' creative thinking abilities, such as by providing problem-solving questions that allow students to solve them with various strategies.

Keywords: Creative Thinking Level, Ill Structured Problems, Mathematical Ability, Calorie Intake

Abstrak

Dalam pembelajaran matematika, berpikir kreatif sangat penting karena memungkinkan pemikiran luas untuk menemukan solusi baru dalam pemecahan masalah. Tujuan penelitian ini adalah untuk mendeskripsikan tingkat kreativitas siswa dalam menyelesaikan soal ill-structured problems konteks calorie intake. Jenis penelitian ini adalah deskriptif menggunakan pendekatan kualitatif. Untuk menenentukan subjek penelitian, peneliti memilih tiga siswa kelas VIII dengan tingkat kemampuan matematika yang berbeda (tinggi, sedang, dan rendah) berdasarkan nilai matematika. Peneliti menggunakan tes ill structured problems dan wawancara untuk mengumpulkan data. Data berupa hasil tes dianalisis berdasarkan tingkat berpikir kreatif siswa dan wawancara lanjutan. Hasil penelitian menunjukkan pada aspek fluency, S1 dan S2 dapat memberikan dua jawaban dengan tepat sedangkan S3 hanya memberikan satu jawaban dengan tepat. Aspek flexibility, S1 dan S2 dapat memberikan alternatif jawaban menggunakan konsep matematika yang berbeda sedangkan S3 hanya memberikan satu cara alternatif jawaban. Aspek originality, S1 dapat memberikan dua solusi unik sedangkan S2 dan S3 menghasilkan solusi biasa. Berdasarkan hal tersebut, S1 termasuk kategori level 4 (sangat kreatif), S2 termasuk kategori level 3 (kreatif), dan S3 termasuk kategori level 0 (tidak kreatif). Melalui hasil penelitian, pembelajaran yang dirancang harus merangsang kemampuan berpikir kreatif seperti memberikan soal pemecahan masalah yang memungkinkan siswa menyelesaikannya dengan berbagai strategi.

Kata kunci: Tingkat Berpikir Kreatif, Soal Tidak Terstruktur, Kemampuan Matematika, Asupan Kalori

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Introduction

Students in the twenty-first century must have four basic skills: critical thinking, communication, creative thinking, and collaboration. The ability to think creatively is one of the fundamental abilities that students must have because it allows them to produce ideas that can be used in the real world. The ability to think creatively involves paying attention to intuition, activating imagination, revealing new possibilities, opening a broad viewpoint, and discovering new ideas (Suripah & Sthephani, 2017). Creative thinking can also be referred to as a method or process that produces new ideas that are helpful

in generating several alternative alternatives for exploring the existing situation (Putri et al., 2019). In learning mathematics, creative thinking skills are also important for students because the material in mathematics requires creativity in the learning process. The ability to solve mathematical problems having more than one solution is referred to as mathematical creative thinking (Kozlowski et al., 2019). Fluency, flexibility, creativity, and elaboration are the aspects used to evaluate mathematical creative thinking ability (Schindler & Lilienthal, 2020).

Aspect fluency as an indicator of creative thinking relates to the ability to produce ideas; the more ideas generated, the more creative one's thinking (Smyrnaiou et al., 2020). For the aspect of flexibility, it describes the individual's ability to examine at many problems from all perspectives so that they are not trapped in assuming rules that cannot be applied to a problem. Guilford (1967) stated that the aspect of originality refers to the uniqueness of responses or ideas that rarely occur (Schindler & Lilienthal, 2022). Schindler & Lilienthal (2022) define the last aspect, the elaboration aspect, as a connection between the level of detail in the answers presented and the creative ideas that exist within the individual. Students who satisfy the fluency aspect may generate a lot of ideas and solutions when solving problems; the flexibility aspect can produce varied answers (Bozkurt Altan & Tan, 2021); the original aspect can find solutions or answers that are very unique and unusual for that level of individual knowledge (Assmus & Fritzlar, 2022); the elaboration aspect can develop an idea by detailing an idea (Kozlowski et al., 2019). Of the four aspects of creative thinking, Silver suggests three aspects for evaluating the creativity of children and adults, namely fluency, flexibility, and originality (Shoimah et al., 2018). Furthermore, the creativity of a person can be divided into several levels. The primary aspects of the characteristics of the level of creative thinking differ for each level. The difference is found in aspects of creative thinking such as fluency, flexibility, and originality in solving mathematical problems (Shoimah et al., 2018). There are five levels of creative thinking: level 0 (not creative), level 1 (less creative), level 2 (quite creative), level 3 (creative), and level 4 (extremely or very creative). Students who are at level 4 can solve problems with more than one answer (fluency), can use another method to solve it (flexibility), and solutions meet originality (originality); level 3 can solve a problem with various solutions (fluency), but he can't use any other way or method to solve it (flexibility), and there is one solution satisfying originality (originality) or he can use another way or method to solve the problem (flexibility), but he cannot create a new solution (originality); level 2 can solve a problem with an unusual solution (originality), but fails to fulfill the fluency aspect (fluency) or no flexibility (flexibility); level 1 can solve a problem with more than one answer (fluency) but can't use any other way or method to solve it (flexibility), and the solution does not live up to originality (originality); level 0 cannot solve a problem with more than one answer (fluency), can't use any other way to solve it (flexibility), and the solution lacks uniqueness (originality) (Aini et al., 2020).

Problem solving and creative thinking are intimately connected. This is because problem solving may boost individual creativity, and creativity can help people solve problems more easily (Calavia et al., 2021). There are two types of problems in mathematics, namely good problems and bad problems. The characteristic that these problems are good problems is that these problems can connect the knowledge and experience gained when solving problems to other problems (Cho & Kim, 2020). According to Cho and Kim (2020), one kind of good problem is an unstructured problem (ill-structured problem) since addressing these questions leads to varied conclusions that students reach using active inquiry and promotes students to engage in advanced higher-order thinking. Ill-structured problems have a lot of data, facts, and viewpoints but do not always have explicit questions (Malogianni et al., 2021). Several studies define the characteristics of unstructured problems (ill-structured problems) as authenticity, complexity, and openness (Johansen, 1997; Byun et al., 2014; Hong & Kim, 2016;Santia et al., 2019). According to Santia et al. (2019), a problem is authentic if it encompasses the context of everyday life and is relevant enough to infer a component of a real-world situation. Complexity refers to the presence of undetermined concepts, rules, knowledge, and principles for solving problems

(Firdausi et al., 2021). In terms of openness, Jonassen (1997) in Santia et al. (2019) indicates that: first, various criteria for evaluation must exist in order to solve the problem; second, the purpose of the problem is not clearly stated; and third, students must share their personal opinions and beliefs about the topic. When dealing with ill-structured problems, students must reframe the design problem, recognize and consider alternative points of view, and gather evidence or assumptions to support or reject alternative solutions (Guaman-Quintanilla et al., 2022).

Creativity of students in solving a problem is different. A factor influencing this is the students' mathematical ability. This is reinforced by Stolte's (2019) research, which claims that mathematical creativity is dependent on mathematical abilities. Mann's (2005) dissertation, which studies the relationship between mathematical creativity and mathematical ability, is one piece of research that delves deeply into this issue. Mann discovered a statistically significant relationship between mathematical ability and mathematical creativity (Kozlowski et al., 2019). According to this study, students who have high mathematical abilities are more creative than students with medium or low mathematical abilities.

In this study, researchers used ill-structured problems in the context of calorie intake to find out the creativity of the subject under study. Contextual calorie intake is not widely used even though the context is interesting and close to students because it relates to their health conditions. Calorie intake is a calorie requirement that must be met, which depends on resting energy expenditure and the amount of physical activity carried out to determine total energy expenditure (Bilgen et al., 2020). According to Bilgen et al. (2020), if it is associated with children's calorie intake, it helps to lose or gain weight. Context calorie intake is considered suitable for ill-structured problems in learning mathematics because questions or tasks that lead to creativity are most often suggested, one of which is modeling problems related to real world life (Bicer et al., 2022). One form of mathematics material from context calorie intake is calculating the average weight that is not ideal from several children provided and then determining the target weight gain for the child. By using context calorie intake, learning Mathematics will be closer to the real life of students.

However, research that explores students' creative thinking abilities in ill structured problems still a little bit. Some of these studies, such as that conducted by Al - Ghofiqi et al., (2019) are concerned with the creative thinking abilities of students who have low mathematical abilities when solving ill-structured problems. Then, Firdausi et al. (2021) accomplished another study on the creative thinking processes of high-ability students when solving ill-structured problems. Unfortunately, many have not analyzed the level of creativity in ill-structured problems, and the use of context in ill-structured problems is still relatively ordinary and uninteresting. Based on this, the researcher is interested in analyzing and describing the level of students' creative thinking skills when solving ill-structured problems using context calorie intake.

Method

This study is a type of qualitative research using an approach called descriptive that tries to analyze and describe students' levels of creativity when solving ill-structured problems using context calorie intake. Participants for the study were chosen based on their mathematical ability (high, medium, and low). To select the research subjects, the researchers involved eighth grade students at SMPN 4 Pare. The researcher looked at the mathematical abilities of the selected subjects through the students' mathematic scores and the recommendations given by the mathematic teacher at the school. Using this data, the researcher found one student with high mathematical ability (as S1), one with medium mathematical ability (as S2), and one with low mathematical ability (as S3). Of the three selected subjects, a test was given in the form of an ill-structured problem context calorie intake with a processing time of 40 minutes, followed by a follow-up interview on the test results that had been

obtained. All interviews were audio recorded and verbally transcribed for data analysis.

Test questions were developed using real-life situations, namely calorie intake, and presented as unstructured problems (ill-structured problems). The material used in this problem is calculating the average data in the statistics class, which is taught to class VIII students. The following questions have been developed:

Question

Look at the following table

Child Weight

Names	Gender	Weight (Kg)					
		January	February	March	April	May	June
Aiden	Man	11	11,3	12	12,4	13	13,5
Axel	Man	10,1	10,5	11	11,4	12,4	12,8
Cindy	Woman	11,8	12,1	12,5	13	13,4	13,9
Dava	Man	9,2	9,5	10	10,2	10,5	10,7
Dom	Man	11,4	12	12,7	13	13,4	14
Fery	Man	13,9	14,2	14,4	14,9	15,3	15,9
Serra	Woman	10,3	11,3	11,8	12,3	12,7	13,2
Tea	Woman	9	9,4	9,8	9,3	9,6	10
Tifany	Woman	13,1	13,4	13,7	14,1	14,5	15
Zea	Woman	9,2	9,4	9,8	9,5	9,7	10,4

Based on the data provided, the Nutritionist from Dr. Elen, namely Mrs. Novi, wants to help improve the nutritional intake of children aged around 2 years who have an average body weight that is below the ideal body weight according to WHO. The following is the most optimal ideal body weight according to WHO based on gender and age:

1. Age 2 years
   Woman = 10 kg – 13 kg
   Man = 10,8 kg – 13,8 kg
2. Age 3 years
   Woman = 12,1 kg – 15,9 kg
   Man = 12,7 kg – 16,3 kg

Improvement of nutritional intake reviews the daily nutritional adequacy rate. To increase your body weight by 1 kg per week you need to add about 1000 calories per day. Help Mrs. Novi in making a target weight that must be increased for the next 6 months and determine how many calories per day on average to fulfill the child's nutrition if Mrs. Novi wants the child to reach the ideal weight target!

The questions were developed based on criteria Ill structured problems namely authenticity, complexity, and openness (Hong & Kim, 2016;Santia et al., 2019). Authenticity is shown in the problem that there are real-life problems, namely not ideal body weight and daily calories needed to help gain weight. Complexity can be seen that when solving this problem there are no specific rules. Students are free to use the mathematical concepts they have to solve the problem. Openness is shown that students

have to look for additional information and make assumptions to make it easier to do. The following is some information or assumptions that may arise:

a. If students assume the ages of 10 children are not the same as 2 years, all in January, for example, there are 2.5, some are 2.6 and so on, then students must find information on the ideal weight according to the child's age. For example, the last target was in December, if the child's age in January was 2.5 years, then the child's age in December would be 3.5 years. Of course the ideal weight presented in the questions is not quite right and you have to look again.
b. Calories per day (ideally) according to a predetermined age. In this problem it is not displayed so students have to look for additional information on their own.
c. The calories added per day are actually known, but if students make new assumptions that are not in accordance with what is known, then students must look for additional calories per day (according to the target that has been sought).

After the tests were completed, the researchers conducted follow-up interviews with the aim of finding out more about the answers given by students based on aspects of creative thinking. The following are guidelines for interviewing researchers:

Table 1. Interview guidelines

Aspects of Creative Thinking	**Data and How to Obtain It**
Fluency	1. Data : The way students receive and understand the ill-structured problems given How to get data: 1) Have you encountered this context before? In what cases? 2) Do you understand what this question means? Tell me about this problem and what information it contains! 3) If so, what is your process in finding answers? If not, what made you not understand the matter? 2. Data : Students generate more than 1 answer or idea How to get data: 1) Is there only one alternative solution to this problem?
Flexibility	Data : A way for students to generate answers with a variety of ideas and points of view How to get data: 1) Is the problem's information enough to solve it? 2) What information should be sought or assumed to help solve the problem? 3) How do you solve ill-structured problems? 4) Is there another way or idea for finding your weight gain goal other than the weight gain goal you've set? If there is, please show another way that you think can help solve this problem!
Originality	Data : A way for students to generate unique and new answers by modifying existing ideas How to get data: 1) Have you checked the results of solving the problem again? 2) In your opinion, is the target to increase the weight that you have made the most appropriate alternative?

	3) How did you come up with this alternative? (If the subject finds a unique solution).

Furthermore, the data were analyzed using data reduction, data display, and conclusion drawing (Miles et al., 2014). Data reduction is the process of choosing, simplifying, abstracting, and changing information from test and interview results. Researchers will analyze data from tests and interviews using the level of creative thinking outlined by Aini et al. (2020) based on aspects of creative thinking such as fluency, flexibility, and originality. Researchers use Table 2 below to determine the level of creative thinking of subjects based on aspects of creative thinking such as fluency, flexibility, and originality :

Table 2. Creative Thinking Level

Level of Creative Thinking	Characteristics of the Level of Creative Thinking
Level 4 (Very Creative)	Students can solve problems with several solutions (fluency), choose another method for solving it (flexibility), and the answer is unique (originality).
Level 3 (Creative)	Students can solve problems with more than one solution (fluency), can't use any other way to solve it (flexibility), and one solution satisfies novelty (originality). Characteristics of other solutions (alternatives), the ability to solve problems with more than one solution (fluency), the ability to utilize another means of solving the problem (flexibility), but are unable to produce a new solution (originality). This can be taken as students having just two characteristics of creative thinking.
Level 2 (Quite Creative)	Students can solve problems in unique ways (originality), but they lack fluency and flexibility.
Level 1 (Less Creative)	Students can solve problems with several solutions (fluency), but they can't use any other way or method to solve them (flexibility), and the solution or answer also doesn't live up to novelty (originality).
Level 0 (Not Creative)	Students cannot solve a problem with more than one solution (fluency), they cannot solve it in another way (flexibility), and the solution is not innovation (originality).

Result and Discussion

Understanding certain problems can be improved by using creative thinking. These suggestions may lead to the discovery of many solutions to the problem. According to Silver (1997), three aspects influence creative thinking skills in mathematics problem solving: fluency, adaptability, and originality. This study found that students may be creative while solving ill-structured problems, despite the fact that some students are less than ideal. This result is based on the results of tests and interviews conducted while solving ill-structured problems. The following are the results of the study:

Table 3. Aspects of Creative Thinking on Research Subjects

Subjects	Aspects of Creative Thinking

	Fluency	Flexibility	Originality
Subject 1 (S1)	Fulfil	Fulfil	Fulfil
Subject 2 (S2)	Fulfil	Fulfil	No
Subject 3 (S3)	No	No	No

S1 can fulfill aspects of creative thinking, namely fluency, flexibility, and originality in solving ill-structured problems context calorie intake. As a result, S1 is at the level of creative thinking at level 4 (extremely or very creative). S2 only satisfies aspects of creative thinking fluency and flexibility in solving ill-structured problems in the context of calorie intake. As a result, S2 is at the level of creative thinking at level 3 (creative). While the S3 cannot fulfill all aspects of creative thinking, namely fluency, flexibility, and originality in solving ill-structured problems in the context of calorie intake. As a result, S3 is at creative thinking level 0 (not creative).

The following is the result and discussion of students' answers in working on the test's ill-structured problems of context calorie intake, along with interview excerpts related to student answers:

Aspect Fluency

Students which fulfill the fluency aspect can produce an extensive variety of solutions to problems (Junaedi et al., 2021). From the results of student answers, Subject 1 (S1) and Subject 2 (S2) could show more than 1 answer. S1 showed two answers in solving the problems given. S1 also understands the problem well because S1 is already familiar with the term "calories" when studying material on healthy eating patterns for class VII Physical Education subjects. The results of the S1 answers were investigated further from the following interview results:

Researcher : "Have you encountered this context before?"
S1 : "Just know the term calorie, Sis."
Researcher : “Do you understand what this means? Try to tell me about this and what information is in the problem!”
S1 : "The point of this question, I was asked to make a weight gain target for children who are under ideal weight for 6 months. What I know from the question is the table of weight and ideal body weight for children aged 2 and 3 years. However, the daily calories are not there so I am looking for that information”
Researcher : "Good. Is there only one alternative solution to this problem?
S1 : "I found 2 answers in different ways Sis."

S2 shows two answers in solving the problems given. S2 also understands the problem well even though he forgets the term calorie which is in the healthy eating pattern material so he has to read the questions several times. The results of the S2 answers were investigated further from the following interview results:

Researcher : "Have you encountered this context before?"
S2 : "Not yet sister."
Researcher : "Do you understand what this means? Try to tell me about this and what information is in the problem!"
S2 : "From this problem, I will make a record of weight gain for children who are not ideal Sis. Based on the question, all the children already have weight, then I look for children who are not ideal, after that they record the increase."
Researcher : "Good. Is there only one alternative solution to this problem?
S2 : "I found 2 answers in different ways Sis."

While Subject 3 (S3) only gave 1 answer to the problem given. S3 does not understand the problem. This can be seen from the estimated weight gain targets that have been made without considering the

ideal body weight of children according to their age. The results of these answers are strengthened by the following interviews:

Researcher : "Have you encountered this context before?"
S3 : "Never."
Researcher : "Okay. Do you understand the point of this matter? Try to tell me about this and what information is in the problem!"
S3 : "From this question, I was asked to estimate the child's weight to be ideal, Sis. In the question, the appropriate ideal body weight and weight range have been provided."
Researcher : "Is there only one alternative solution to this problem?"
S3 : "Yes Sis, only 1 course"
Researcher :"Why? Is there no other alternative that can help you solve it?"
S3 : "No sis because when setting a weight target you can only do it by guesswork so that the weight continues to increase."
Researcher : "What was considered when estimating the target weight?"
S3 : "I just added the same number to make it easy."

S1 and S2 produce two answers in different ways. This is in accordance with the results of Junaedi et al. (2021), who showed that students with high and moderate ability can complete the fluency aspects of their answers. S1 and S2 are able to understand the problem well. The difference is that S1 is easier to understand than S2. S1 still remembers the material that alludes to calories, namely healthy lifestyle material, while S2 has forgotten the material, so S2 needs to read the problem several times to understand the problems given. A good understanding of the problem allows S1 and S2 to find important information on the questions that are provided or what they have to look for. When they are able to understand the questions well, S1 and S2 are also easier to reframe the problems presented and determine the mathematical concepts to be used. That way, S1 and S2 are more helpful when working on so they can get 2 answers in different ways based on the context and mathematical concepts used. In contrast to S1 and S2, S3 failed to fulfill the fluency aspect. When solving the questions, S3 only presents one alternate solution. The reason is that S3 doesn't understand the problem, despite trying to solve it. This can be seen from the estimated weight gain targets that have been made without considering the ideal body weight of children according to their age. S3 just estimates weight gain in order to make problem solving easier. Thus, S1 and S2 fulfill the fluency aspect, while S3 does not fulfill the fluency aspect.

In completing the ill-structured problem (TISP), only S1 and S2 are able to make various interpretations when setting weight gain targets along with daily calories. This indicates conformity with one of the properties that exist in an ill-structured problem, namely openness, where there is an opportunity for students to write down various interpretations in solving problems (Santia et al., 2019). Regarding the use of context calorie intake, the questions have never been obtained by all subjects. Some of the subjects only knew the term calorie when studying certain materials. In fact, this context is very close to students' daily lives, namely weight. Furthermore, one of the characteristics of an ill-structured problem is authenticity, where the context relates to everyday life and is relevant enough to infer a portion of the real-life situation (Santia et al., 2019). The use of appropriate context in the form of problems or practice questions, both routine and non-routine, has a favorable influence on student involvement in learning and can encourage students to think critically and creatively while solving mathematical problems (Saputri & Zulkardi, 2019). Therefore, researchers try to use context calorie intake to see and train students' creativity.

Aspect Flexibility

Students who fulfill aspects of flexibility change their train of thought when they encounter a

thought block or come up with a different type of solution or idea (Yayuk et al., 2020). From the results of student answers, Subject 1 (S1) and Subject 2 (S2) can provide different alternative answers. According to the results of S1's answers, the first method of S1 is to increase the weight of each child with the help of the difference between the minimum and maximum limits. Then, the second method of S1 is to determine the increasing weight gain every month for each child adjusted to the minimum and maximum limits that have been calculated previously and use the pattern to determine daily calories. The following are the results of S1's solutions:

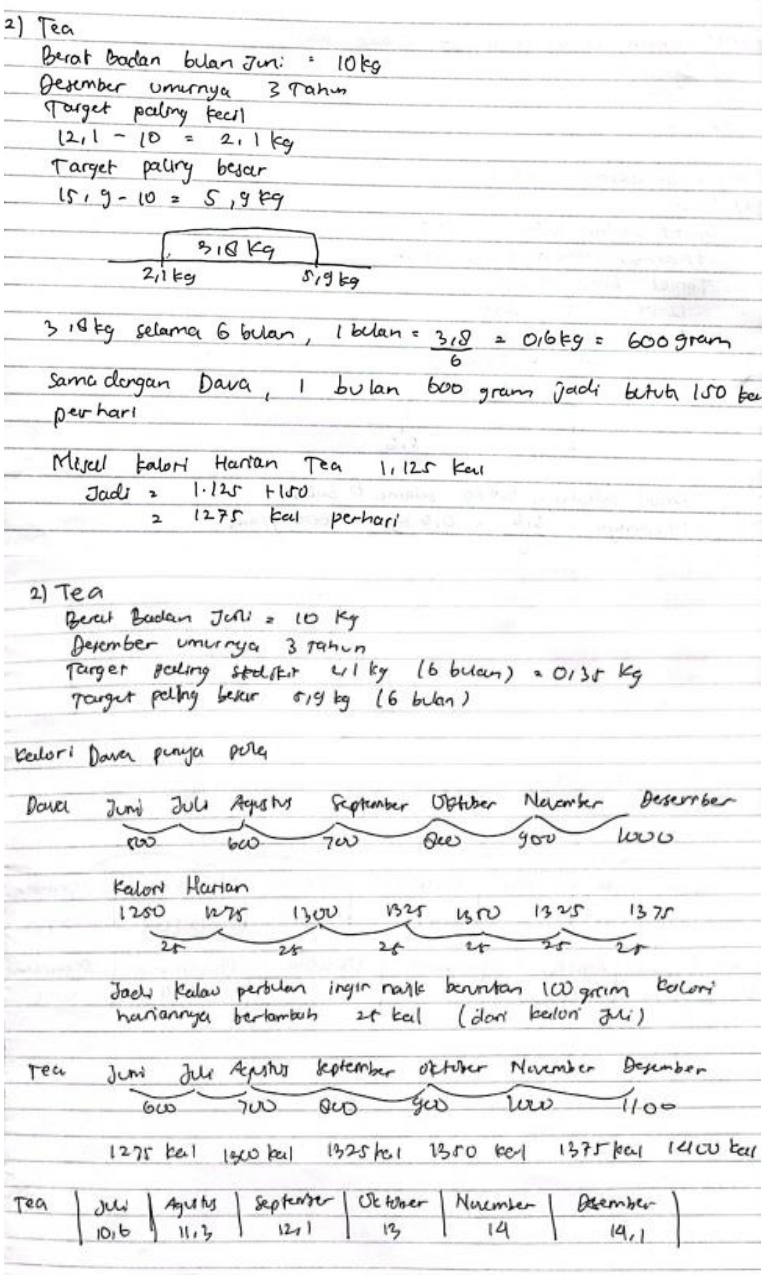


Figure 1. Written solutions S1 in Aspect of Flexibility

This is supported by the following interview results:

Researcher : "Is the problem's information enough to solve it?"

S1 : "No Sis, I need to find some more information."

Researcher : "What information are you looking for to help you solve the problem?"
S1 :"I looked for the daily calories of a 2-year-old and 3-year-old child, then made 10 children the same age, Sis."
Researcher : "Okay, why do you make this minimum and maximum range when raising a child's weight that is not ideal?"
S1 :"Because if I don't set a limit later it might still not be ideal Sis."

From the results of the interviews, the reason for S1 is to use the minimum and maximum limits so that the results of the target weight gain for children who are not ideal are still in the ideal weight range.

The first method of S1 is quite accurate for making weight gain targets because it uses the difference between the minimum and maximum increase limits that should be met. That way, children who have less than ideal weight will definitely be ideal in December. Then, the second way from S1 is often the recommendation of nutritionists in children where the child's weight gain is required to increase gradually every month. In addition, using one child's daily calorie pattern which is not ideal will speed up S1 calculations and this is in accordance with the mathematical concepts that can be used in this problem.

Just like S1, S2 also produces two alternative answers shown in the following figure 2:

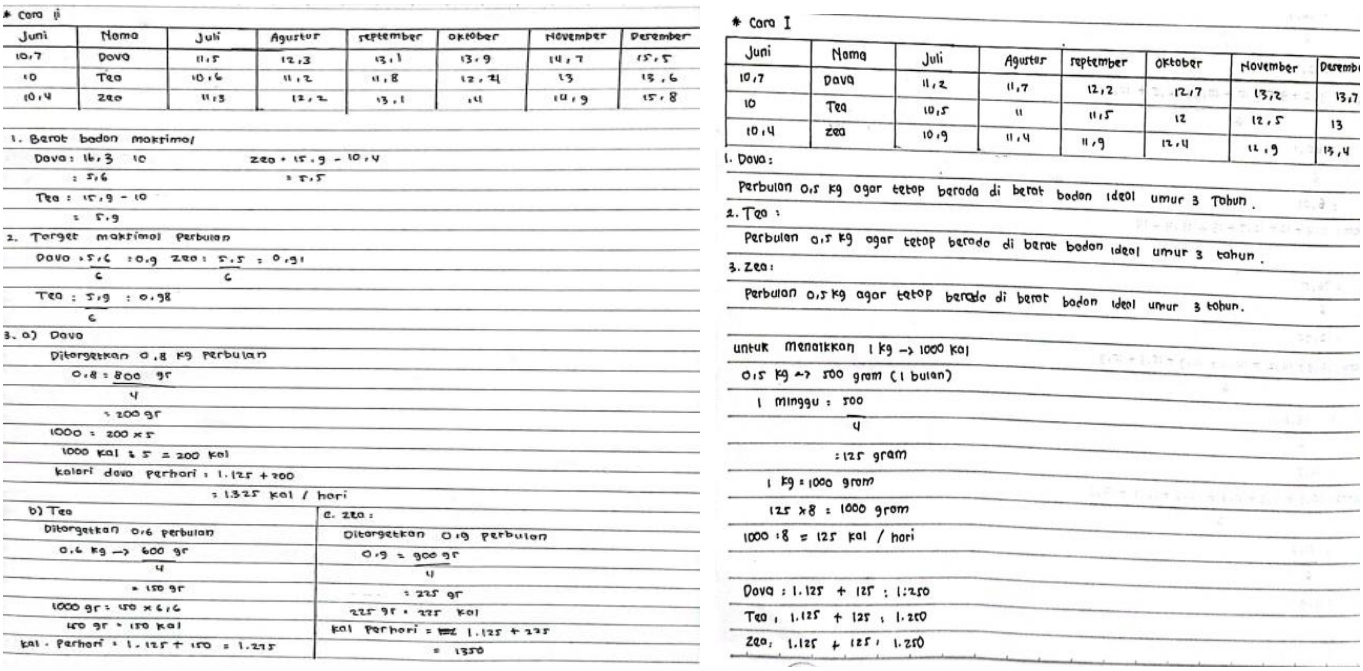


Figure 2. Written solutions S2 in the Aspect of Flexibilty

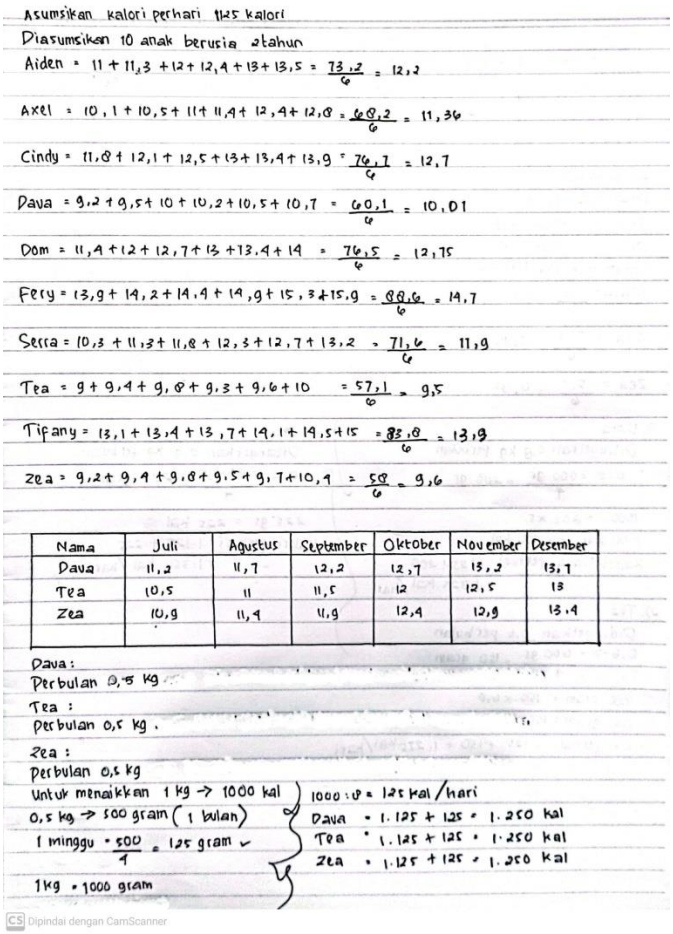
The first way, the target for increasing the weight of each child who has an ideal weight is made the same (0.5 kg in a month applies to all children). The second way is to determine the maximum limit first so that the weight gain target will be different for each child. This is supported by the following interview results:

Researcher : "Is the problem's information enough to solve it?"
S2 : "Not enough, I need to find some more information."
Researcher :"What information are you looking for to help you solve the problem?"
S2 :"I'm looking for daily calories from children aged 2 to 3 years and those 10 children are considered to be 2 years old Sis."
Researcher : "Okay, why did you choose 0.5 kg to increase the weight of the 3 children?"

S2 :"With 0.5 kg, the weight in December is ideal and does not exceed the ideal weight range for 3 years Sis."
Researcher :"Okay. For other methods, why is it necessary to set a maximum limit?"
S2 :"So that you know what the biggest target is, Sis, so you don't gain too much weight."

In contrast to S1, S2 uses the target weight gain for children whose weight is not ideal by estimating the weight that is still within the ideal weight range and determining the maximum limit for weight gain to reach the ideal body weight. However, S2 did not make the minimum limit of the weight gain target made as did S1. As a result, the increase target that has been made may not reach the ideal. In fact, this minimum limit helps her to set a weight gain target that remains within the ideal body weight limit.

Unlike S1 and S2, S3 only produces one way or solution to solve the problem. S3 makes the target weight gain for all children who are not ideal to be made the same per month as shown in the following figure 3:


Asumsikan kalori perhari 1125 kalori
Diasumsikan 10 anak berusia 2tahun
Aiden = 11 + 11,3 + 12 + 12,4 + 13 + 13,5 = 73,2 / 6 = 12,2
Axel = 10,1 + 10,5 + 11 + 11,4 + 12,4 + 12,8 = 68,2 / 6 = 11,36
Cindy = 11,8 + 12,1 + 12,5 + 13 + 13,4 + 13,9 = 76,7 / 6 = 12,7
Dava = 9,2 + 9,5 + 10 + 10,2 + 10,5 + 10,7 = 60,1 / 6 = 10,01
Dom = 11,4 + 12 + 12,7 + 13 + 13,4 + 14 = 76,5 / 6 = 12,75
Fery = 13,9 + 14,2 + 14,4 + 14,9 + 15,3 + 15,9 = 88,6 / 6 = 14,7
Secca = 10,3 + 11,3 + 11,8 + 12,3 + 12,7 + 13,2 = 71,6 / 6 = 11,9
Tea = 9 + 9,4 + 9,8 + 9,3 + 9,6 + 10 = 57,1 / 6 = 9,5
Tifany = 13,1 + 13,4 + 13,7 + 14,1 + 14,5 + 15 = 83,8 / 6 = 13,9
Zea = 9,2 + 9,4 + 9,8 + 9,5 + 9,7 + 10,4 = 58 / 6 = 9,6

Nama	Juli	Agustus	September	Oktober	November	Desember
Dava	11,2	11,7	12,2	12,7	13,2	13,7
Tea	10,5	11	11,5	12	12,5	13
Zea	10,9	11,4	11,9	12,4	12,9	13,4

Dava :
Perbulan 0,5 kg
Tea :
Perbulan 0,5 kg
Zea :
Perbulan 0,5 kg
untuk menaikkan 1 kg → 1000 kal
0,5 kg → 500 gram (1 bulan)
1 minggu = 500 / 4 = 125 gram
1kg = 1000 gram
1000 : 8 = 125 kal/hari
Dava = 1.125 + 125 = 1.250 kal
Tea = 1.125 + 125 = 1.250 kal
Zea = 1.125 + 125 = 1.250 kal
CS Dipindai dengan CamScanner

Figure 3. Written solutions S3 in the Aspect of Flexibilty

It adds 0.5 kg on a recurring or monthly basis for all children. From S3's work, it is correct that in December, all children who originally had a weight that was not ideal became ideal. This is supported by the following interview results:

Researcher : "Is the information in the problem enough to solve the problem?"
S3 : "Not enough, I'm looking for some more information Sis."
Researcher : "What information are you looking for to help you solve the problem?"
S3 : "Daily calories of a 2 to 3-year-old child."
Researcher : "Okay, what is your reason for choosing 0.5 kg per month to increase the weight of

the three children?"

S3 : "I tried it, Sis, and it turned out that I still met her ideal body weight."

Researcher : "If I use 1 kg per month is that okay?"

S3 : "It's okay, Sis, as long as you stay at your ideal weight."

Researcher : "Approximately how much weight should you increase per month?"

S3 :"If it's the biggest, I don't know yet, Sis. But as long as the ideal is still stretched, a 3-year-old child can still do it, Sis."

In contrast to S1 and S2, S3 fails to fulfill the flexibility aspect expressed by Yayuk et al (2020). S3 only provides one alternative way or idea to solve the problem. The idea of S3 is to add 0.5 kg repeatedly or apply every month for all children. However, on the S3 work sheet, no reasons were given regarding the selection of 0.5 kg, which was used as the target for increasing body weight per month. S3 doesn't know the maximum monthly limit when gaining weight. In fact, the minimum and maximum limits must be known so that the target weight gain will be in the ideal range. In addition, the help of these minimum and maximum limits makes it easy for S3 to estimate weight gain which is in the ideal range. Even though trial and error is allowed, the weight gain must be in accordance with the ideal weight of the child at the age that has been previously assumed. Thus S1 and S2 fulfill the flexibility aspect (flexibility) while S3 does not fulfill the flexibility aspect.

When solving ill-structured problems, S1, S2, and S3 solve the problem not only based on the information in the problem. There needs to be additional subjective information, relevant concepts, or rules to be able to solve the ill-structured problem. This is in accordance with the understanding of one of the inherent properties of ill-structured problem complexity, which is the existence of uncertain concepts, rules, information, and principles to solve problems. (Hong & Kim, 2016; Santia et al., 2019).

Aspect Originality

Students who meet the originality aspect are seen in their ability to find very distinctive ways of answering and unusual solutions or ideas for the individual level, then create new solutions and ideas (Kozlowski et al., 2019; Suherman & Vidákovich, 2022). In this aspect, only S1 can provide a unique solution when solving this ill-structured problem. This is shown in the alternating solution S1:

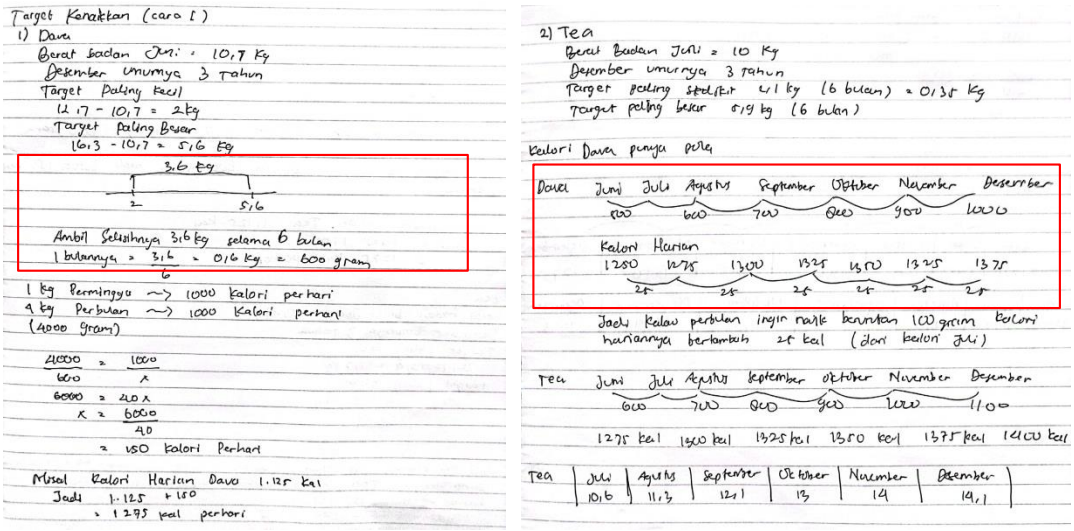


Figure 4. Written solutions S1 in Aspect of Originality

In the first alternative, S1 uses the difference between the minimum and maximum limits divided by 6 months so that it finds the target to increase body weight per month. For the second alternative, S1 finds the daily calorie pattern when body weight increases by certain kilograms. This is supported by the following interview results:

Researcher : "How did you come up with this alternative? Please explain!"
S1 : "For the first method, I choose the difference so that the target is not less or not more, Sis. In the second way, after finding Dava's daily calories, I found a pattern if I added 100 grams per month from the previous target, for example 0.5 kg to 0.6 kg, then the total daily calories will increase by 25 calories, Sis."

S1 can provide unique solutions when solving ill-structured problems. When determining weight gain using the difference between the minimum and maximum impact on the target that is made so that the results are right (not less or not exceeding the ideal body weight). In addition, by finding the calorie pattern of one child who has an ideal body weight, it can be a calorie pattern that is applied to 2 other children who have a body weight that is not ideal because the minimum daily calorie assumption has been made the same before.

S2 does not show a unique solution to solving ill-structured problems. In the first alternative, S2 measures weight gain per month as long as it meets the ideal weight range. In the second alternative, S2 determines the maximum limit for her monthly increase target to make it easier for her to estimate her monthly weight gain target. Based on the results of S2's work, it is also seen that he is not looking for the smallest target to increase his monthly weight, even though this minimum limit is important to help him set a weight gain target that is not less than the ideal body weight.

S3 also fails to show a unique solution to ill-structured problems. This is consistent with the results of Al-Ghofiqi et al. (2019), who discovered that students with low mathematical abilities fail to show the uniqueness of their answers. S3 only estimates the weight gain target for 6 months without considering whether the weight target that has been made can make a child who was originally not ideal become ideal. Based on the research results, S3 also does not know the biggest and smallest targets for increasing her monthly weight, even though the maximum and minimum limits are important to help her set the right weight gain targets. Thus S1 fulfills the originality aspect while S2 and S3 did not fulfill the originality aspect.

Conclusion

Based on the research, it can be concluded that students who have different mathematical abilities have different levels of creativity. From the results of the ill-structured problem context calorie intake test, students with high mathematical abilities are categorized as creative thinking level 4 (very creative); students with medium mathematical abilities are categorized as creative thinking level 3 (creative); and students with low mathematical abilities are categorized as creative thinking level 0 (not creative). Students who are at level 4 can present two answers with different mathematical concepts and ideas that are unique (unusual). The idea given by S1 was to make a weight gain target along with daily calories through the concept of a pattern that he got from one of the children who was not ideal and to make maximum and minimum limits for a child's weight gain.

Students who are at level 3 can present 2 answers with different mathematical concepts but the ideas given are not unique (ordinary). S2 uses the target for increasing the weight of each child who has a weight that is not ideal is made the same (0.5 kg in a month applies to all children). Another way is to determine the maximum limit first but S2 does not make the minimum limit which is actually also important to help S2 determine the target weight. Unlike S1 and S2, students who are at level 0 only present one answer, and the ideas given are also not unique (ordinary). S3 only estimates the child's weight gain, which is not ideal without strong considerations. This is because the S1 is not able to reframe the given problem properly.

In terms of the use of context, context calorie intake has never been obtained by all subjects. Some of the subjects only knew the term calorie when studying certain materials. So they have to look for information related to the given context. According to the results of this study, teacher-designed mathematics lessons must improve students' creative thinking abilities. This may be accomplished by

providing problem-solving problems of various kinds and allowing students to solve them using a variety of strategies or solutions. As a result, student creativity will be promoted and encouraged..

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