

Elementary Teachers' Noticing of Students': How to Stimulate Students' Critical and Creative Thinking

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Abstract –This research aims to explore elementary teachers noticing in stimulating students' critical and creative thinking abilities. This exploratory qualitative research focuses on the main aspects of teacher noticing (attending, interpreting, and responding) in stimulating students' critical and creative thinking abilities. Research findings on every aspect of elementary school teacher attention show sufficient evidence of stimulating students' critical and creative thinking abilities. In the aspect of attendance, the teacher highlights students' thinking in solving problems through writing. In the interpretation aspect, the teacher interprets students' thinking to understand more deeply the details of students' thinking strategies through two-way communication to expand students' understanding of the thinking strategies used. Based on the results of the interpretation, the teacher decides the student's needs and determines the response that should be given based on the student's level of understanding. The response given was in the form of providing suggestions about new thinking strategies and new learning strategies to expand students' critical and creative thinking.

Keywords – Creative thinking, critical thinking, elementary students, elementary teachers, noticing.

DOI: 10.18421/TEM132-46

<https://doi.org/10.18421/TEM132-46>

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Received: 16 January 2024.

Revised: 22 April 2024.

Accepted: 06 May 2024.

Published: 28 May 2024.

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1. Introduction

Indonesia is still included in the category of developing countries, where Indonesia is still facing with problems of education. This problem is shown by the results of Indonesia's participation in the PISA (Program for International Student Assessment) test, where Indonesia still ranks bottom, namely in 2018 Indonesia's test scores ranked 72 out of 78 participating countries [1], [2]. This shows that Indonesia's global competitiveness is low in comparison with other countries. One of the efforts to improve and face increasingly fierce globalization competition is to improve the quality of education [3].

One of the efforts made to improve the quality of education in Indonesia is by facilitating learning that can develop students' thinking skills, especially critical and creative thinking skills. Critical and creative thinking are special types of higher-order thinking skills in contrast to memorization and translation skills [4]. However, there are still teachers who have not optimally facilitated students' critical and creative thinking skills, due to several reasons, including a lack of teaching experience [5]. [6] and [7] revealed that improving students' critical and creative thinking skills can be done by stimulating students' critical and creative thinking skills through the teaching and learning process. The teacher's knowledge of teaching and learning tactics is the key to success in being able to stimulate students' critical and creative thinking skills [8]. [9] revealed that learning that facilitates students' critical and creative thinking skills as basic skills will enable students to learn to think abstractly and logically. This makes students ready to solve complex and open-ended problems [10].

Learning mathematics is one way to stimulate students' critical and creative thinking skills. Mathematics must be taught starting at the elementary level because mathematics is closely related to students' daily lives [11].

Through learning mathematics, students are provided with material in the form of facts, concepts, procedures, and mathematical principles needed as a prerequisite for learning mathematical concepts at the next level of education [12]. The concept of integers is one of the concepts learned by elementary school students, but this concept still causes students' misconceptions, especially when it involves negative numbers. The problem of students' misconceptions about the concept of integers involving negative numbers must be considered because this concept can bridge new knowledge that identifies the properties of integer arithmetic operations and builds mental strength in solving more complex problems [13]. The difference in the concept of integers that students understand in the learning process with their basic knowledge results in wrong perceptions of positive and negative numbers in integers [14]. Study [15] revealed that a realistic approach to instilling the concept of integers and their operations can lead students to understand the rules for arithmetic operations on integers which helps students create formal reasoning models. The realistic approach that is implemented in learning mathematics in class cannot be separated from the teacher's attention in planning lessons [16]. In addition to realizing that there are misconceptions that occur in students about the concept of integers and their operations, the teacher's attention is needed [17].

Teacher noticing is an activity carried out by the teacher in observing learning activities in class, including students' thoughts. Teachers' noticing of students' thinking builds a structure for teachers to be able to understand and act on their students' conceptions of thinking [18], [19], [20], [21]. The teacher's attention in classroom learning can assist the teacher in determining the right steps to respond to student activities and thoughts [22], [23], [24], [25]. By noticing students' activities in learning mathematics, the teacher can attend to students' basic thoughts, and this can be used by the teacher to determine the response to be given to students' thinking so that students' thinking skills can be honed properly [26], [27], [20]. The teacher's skills in paying attention to students' thoughts help teachers understand students' basic thoughts and develop these students' basic thoughts by providing stimulus in learning [28], [29]. In addition, it is also about how the teacher pays attention to students' thoughts and relates them to the procedures they know to be able to develop student understanding [30], [31].

The quality of teacher knowledge which includes knowledge of technology, pedagogy, and content is one of the main factors that can determine the achievement of learning objectives [32].

Giving good attention to a good learning process is a challenge for young teachers when they experience the transition from being a student to becoming a teacher [5]. So it is not uncommon for young teachers to develop themselves through teacher professional training programs to increase their knowledge in learning practices [33], [34]. Even though they have been following self-development, relatively young beginner teachers tend to have unstable emotions due to a lack of experience, support, and self-understanding needed in the initial period of teaching. From there the question arises, about how elementary teachers respond, interpret, and respond to students' thoughts in learning mathematics, and how elementary teachers stimulate students' critical and creative thinking skills.

Previous research has revealed the aspects and characteristics that emerge from teacher noticing. Study [28] describes the skills of pre-service teachers in scaffolding students. Paper [35] explores noticing prospective teachers in online learning. [36], [5] describe the teacher's noticing of students' mathematical thinking. Study [20] explores teacher noticing of student understanding. [24], [37] describe mathematics instruction as a mathematically significant pedagogical opportunity to construct student thinking. However, no research has yet been found that reveals how elementary teacher noticing stimulates students' critical and creative thinking in learning mathematics, especially in material concepts and operations on integers.

The purpose of this research is to explore the process of elementary teachers in stimulating students' critical and creative thinking skills. There are several ways to classify the forms of teacher noticing skills that emerge in learning mathematics and all agree that teacher noticing is a connected process that integrates three skills: attention, interpretation, and responding. The results of this study are expected to be used as material for consideration regarding teacher noticing in mathematics learning in the classroom and are expected to be the basis for the emergence of other transformative ideas in teacher education as an effort to improve the quality of learning.

2. Research Design and Methodology

This research uses an exploratory qualitative approach to explore elementary teachers noticing in stimulating students' critical and creative thinking abilities. This research focuses on how elementary teacher noticing uses three main aspects of teacher noticing to stimulate students' critical and creative thinking abilities in mathematics learning, especially in integer operations.

This research is designed into three stages of learning practice to see the consistency of aspects of elementary teachers noticing to stimulate students' critical and creative thinking abilities. Elementary teachers who consistently and productively demonstrate the main aspects of teacher attention will be selected as research samples. The relationship between the three main aspects of teacher noticing is presented in Figure 1.

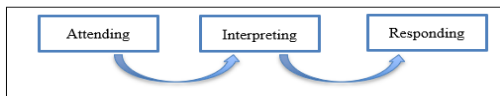


Figure 1. Relationship aspect of teacher noticing

2.1. Research Subject

This research involved seventeen elementary teachers from 9 cities in East Java province, Indonesia. The fifteen elementary school teachers involved in this research consisted of 10 women and 5 men, aged 26 - 38 years with teaching experience between 5 - 10 years. The subject selection used a purposive sampling technique. Subjects were selected based on several criteria, including that the subject had received professional teacher training; the subject has more than 5 years of teaching experience; the subject shows teacher noticing skills; and the subject stated that he was willing to participate in the research. Demographic data for 15 elementary teachers is presented in Table 1.

Table 1. Demographic data of elementary teachers involved in the research

No.	Initial Name	Age (Years Old)	Teaching Experience (Years)	Origin City
1	DYH	27	7	Sidoarjo
2	ELV	26	10	Gresik
3	IDR	30	5	Nganjuk
4	DWS	27	6	Banyuwangi
5	NCK	27	5	Surabaya
6	RZK	28	6	Kediri
7	SYD	28	7	Madura
8	ILL	27	7	Malang
9	DCK	29	10	Malang
10	RYF	31	5	Malang
11	NRL	30	7	Surabaya
12	NAN	29	8	Madiun
13	UTM	36	9	Nganjuk
14	MTA	38	10	Madiun
15	AZH	29	7	Madiun

2.2. Data Collection

The data in this research was obtained through 3 observations of learning practices and interviews. Data from learning observations consists of observation sheets, learning video recordings, student work documents, and researcher observation notes.

Meanwhile, the interview data is in the form of interview recordings. Observation and interview data were transcribed and analyzed. Observations and interviews focused on three main aspects teachers noticed in stimulating students' critical and creative thinking abilities. The observation sheet interview category and sub-category were developed based on the teacher noticing framework [18], [38] which is shown in Table 2.

Table 2. Indicators of teacher noticing on students' critical and creative thinking

Aspects	Category	Sub Category
Attending	Teachers highlight specific activities of learning situations and mathematical details in students' thinking strategies	<ul style="list-style-type: none"> Highlight student activities when analyzing problems Highlight students' stages in solving problems Highlight students' fluency in solving problems Highlights students' varied and divergent thinking ideas Highlight details of students' thinking strategies Highlight the results of student problem-solving
Interpretation	Teachers interpret students' understanding as reflected in their thinking strategies	<ul style="list-style-type: none"> Interpret certain students' thinking strategies Interpret students' varied and different thinking ideas Interpret students' fluency in describing their thinking strategies Build a complete picture of student understanding
Responding	Teachers use what they have learned about students' understanding of specific student thinking situations to develop new thinking strategies.	<ul style="list-style-type: none"> Identify what is needed to take action Build students' understanding with new ways of thinking Recommend next learning steps Propose alternative learning strategies to achieve learning goals

(Developed by Restu Lusiana)

2.3. Analysis of the Data

In this research, data from observation sheets, learning videos, and recorded interviews were analyzed using procedures for data collection, data presentation, and conclusion. Data collection was carried out by transcribing observation sheet data, learning videos, and recorded interviews. Data transcripts are grouped based on indicators of the emergence of teacher noticing aspects which include attending, interpreting, and responding. The data obtained was compared to ensure the validity of the data. Then conclusions are drawn.

3. Results and Discussion

Based on the observations of learning practices (3 learning practices) and interviews conducted with 15 elementary school teachers, not all teachers demonstrated consistent and productive attention skills. Table 3 shows the results of each elementary school teacher's observations on each learning practice based on an observation sheet developed by the teacher paying attention indicators in Table 2.

Table 3. Learning practice observation results

Initial Name	Attending			Interpreting			Responding		
	1 st	2 nd	3 rd	1 st	2 nd	3 rd	1 st	2 nd	3 rd
	practice			practice			practice		
DYH	2	2	2	1	2	2	-	2	2
ELV	5	6	6	4	4	4	2	3	3
IDR	2	3	2	1	1	2	-	1	2
DWS	3	4	4	2	2	3	2	2	3
NCK	2	2	3	-	2	2	-	2	2
RZK	2	3	2	-	1	2	-	1	2
SYD	2	3	4	2	2	2	2	2	3
ILL	3	4	4	2	2	3	2	2	3
DCK	4	4	5	3	2	3	2	3	2
RYF	2	3	2	-	1	2	-	1	2
NRL	3	4	5	2	3	3	2	2	3
NAN	2	2	2	-	2	2	-	2	2
UTM	4	4	6	3	3	4	2	3	3
MTA	3	4	5	2	3	3	2	2	3
AZH	2	2	2	-	2	2	-	1	2

One subject was chosen based on the results of the observations of learning practices in Table 3, as they consistently demonstrated the skill of paying attention to the teacher during class. The teacher selected for this research is identified by their initials, ELV. The objective of this study is to investigate how teachers' noticing skills can enhance the critical and creative thinking abilities of students.

ELV noticing skills to stimulate students' critical and creative thinking

ELV asks students to discuss problems on student worksheets in groups. The problems given regarding integer operations are presented in Figure 2.

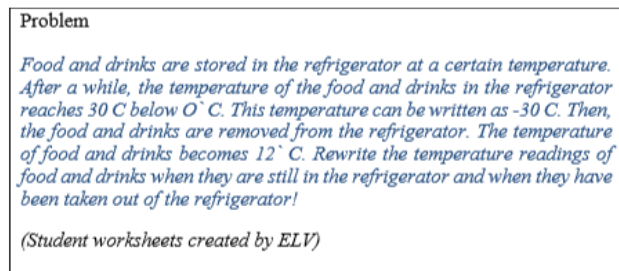


Figure 2. Problem in students' worksheets

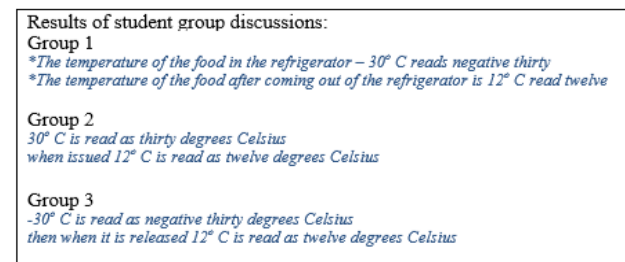


Figure 3. Result of students' group discussions

The main aspect of elementary teachers noticing that appears first in the learning process is attention. This aspect of attention is used by ELV to identify student activities in general and student thinking in particular. ELV provides stimulus in the form of open problems to students. Open problems can be used by teachers to stimulate students' critical and creative thinking [39]. ELV shows the activity of paying attention to students' thinking in general through problem-solving ideas used by students and steps in problem-solving used by students. Below are some of the dialogues (dialogue 1) that occurred during class discussions about open problems given by ELV to stimulate the critical and creative thinking of elementary school students.

Dialogue 1

- ELV : Children, please notice and read the following text! (About food temperature)
 Rewrite the information you read from the text!
- Student : (Reading the text)
- ELV : What do you understand about the text? (Stimulus critical thinking)
- Student : (Observing) So there are two questions right there, ma'am?
- ELV : What questions do you understand?
- Student : They were told to write down the temperature of the food when it was inside and outside the refrigerator, ma'am.
- ELV : OK, now write down the information you get from the text!

ELV pays attention to the three group discussion results on the student's worksheet. ELV dialogue highlights how students analyze problems based on the results of each group's discussion. From the problems given, students were able to communicate the results of their analysis by revealing that the information contained 2 important pieces, namely about the temperature of the food in the refrigerator and outside the refrigerator. Group 1 and group 3 have shown the correct answer but group 2 still shows the incorrect answer. ELV highlights the results of group 2 discussions in more depth and interprets students' understanding through dialogue (dialogue 2).



Figure 4. Discussion between ELV and Group 2

Dialogue 2

- ELV : (Points at information in problem text) How much is this?
- Student : 30 ma'am
- ELV : Try reading the text again! Is there any other information?
- Student : Yes ma'am, it's 30° below 0°.
- ELV : OK, think about what will happen if the refrigerator temperature is below 0°?
- Student : Oh yes ma'am, it will be negative 30°.
- ELV : Yes, that's right. Numbers below 0 or less than 0 are negative integers.

ELV provides descriptive questions to ensure students reanalyze the information provided to stimulate students' critical thinking. From the teacher's descriptive comments, students can build a new understanding of the information provided, namely helping students realize that there is other information that the temperature of food in the refrigerator is 30° C below 0° C. The ELV interpretation aspect appears when students try to expand their thoughts, and students communicate their thoughts about food temperature in the refrigerator -30° C. Students' ideas based on the results of information analysis are a form of the emergence of students' critical thinking [40].

ELV identifies students' needs regarding other problems which can train students to be more skilled in analyzing a problem.

ELV decided to ask students to analyze problem 2 in students' worksheets. The next problem as a follow-up to the results of identifying student needs is presented in Figure 5.

Next Problem

Pay attention to the picture notes regarding the air temperature that occurs!

Morning (heavy snow) -8° C	Afternoon (heavy snow) -7° C	Morning (Sunny) 23° C	Afternoon (cloudy) 20° C
Evening (heavy snow) -6° C	Night (heavy snow) -9° C	Afternoon (drizzle) 16° C	Night (rain) 10° C

- Convert each unit in the picture to integers!
- Make a number line from the combined data of the two images above with the left and right ends marked with arrows. Place 0 in the middle of the number line. Then, positive integers to the right of 0. Negative integers to the left of 0!

(Student worksheets created by ELV)

Figure 5. Next problem in students' worksheets

Results of student group discussions:

Group 1

Group 2

Group 3

Figure 6. Result of student group discussion

Based on the results of each group's answers, the student worksheet is depicted. ELV highlights the incomplete information from group 3 because it does not provide arrows to the right and left of the coordinate line. ELV tries to interpret students' understanding through question and answer with group 3 (dialogue 3).



Figure 6. Students answer teacher (ELV) interpretive questions

Dialogue 3

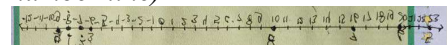
- ELV : What do you understand from the information?
- Student : Data about temperature ma'am. We describe on the coordinate line.
- ELV : Please, describe the number line you drew!
- Student : We describe this known temperature by marking a point on the number line.
- ELV : What is the meaning of the positions of these points?
- Student : (Observing number lines and thinking)
- ELV : Compare the location of each point!
- Student : -9 is to the left of -8, -8 is to the left of -7, and -7 is to the left of -5. 10 to the left of 16, 16 to the left of 20, and 20 to the left of 23.
- ELV : OK, between -9 and -8 which is greater?
- Student : -8, because the bigger the number goes to the right.
- ELV : Is there any other number greater than 23 and smaller than -9?
- Student : There is ma'am. 24, 25, and 26 are greater than 23, and -10, -11 is smaller than -9.
- ELV : So on the number line, you should draw arrows to the right and left to show that other numbers are greater than 23 and smaller than -9.
- Student : We understand ma'am.

In dialogue 3, ELV tries to interpret students' understanding of the concept of integers based on the pictures they make through descriptive and evaluative questions.

Apart from highlighting the answers of students in group 3, ELV also highlighted the information given by group 2 on their worksheet in the form of showing the smallest and largest numbers. Because in the problem they were not asked to show it, group 2 provided additional information that showed critical and creative thinking skills. ELV conducted a dialogue with group 2 to interpret the understanding of students in group 2 regarding the information (dialogue 4).

Dialogue 4

- ELV : Observe the data on temperature conditions in the figure. What do you understand from the information?
- Student : (Observing) The temperature is different ma'am.
- ELV : Is there any other information that you have?
- Student 1 : It's cold in Europe ma'am, all the temperatures are below zero. (Critical and Creative thinking)
- Student 2 : There is a temperature that is the highest 23°C and the lowest is -6°C ma'am.
- ELV : How do you determine the highest temperature is 23° and the lowest temperature is -6° ?
- Student 1 : By sorting ma'am. Like this (shows a number line)
- Teacher : Describe the number line you draw!
- Student : On the number line, the greater the value is to the right and the left the smaller the value.



Based on dialogue 4, ELV interprets the understanding of students in group 2. Student 1 in group 2 shows his critical thinking skills. This is conveyed from information that illustrates that temperatures below 0°C do not occur on the Asian continent but on another continent, namely Europe. Student answers show that students analyze images and skills with the knowledge they have. Apart from that, student 2 in group 2 showed his creative thinking abilities by giving different answers from the other groups. This can be seen when they write additional information about the smallest number and the largest number, even though the questions on the worksheet do not contain this event.

ELV made the decision to provide new problems to stimulate students' thinking. ELV creates instructions that are different from previous problems. This is done to broaden students' conceptual understanding of integers. Apart from that, other problems are given to further stimulate students' critical and creative thinking abilities. The new problem created by ELV is presented in Figure 7.

Other Problem

- Understand the following problems!
The temperature at the top of Mount Jaya Wijaya at night is -5°C . Meanwhile, during the day the temperature becomes 15°C . From the phenomenon of the temperature difference, so the temperature difference at the top of Mount Jaya Wijaya between day and night is...
- Demonstrate the steps to solve the problem with the media "number line banner" or floor plot in the classroom!
- Draw an illustration of the solution steps based on the demonstration done on a number line!
- Solve these problems by discussing them with the group!
(Student worksheets created by ELV)

Figure 7. Other problems created by ELV

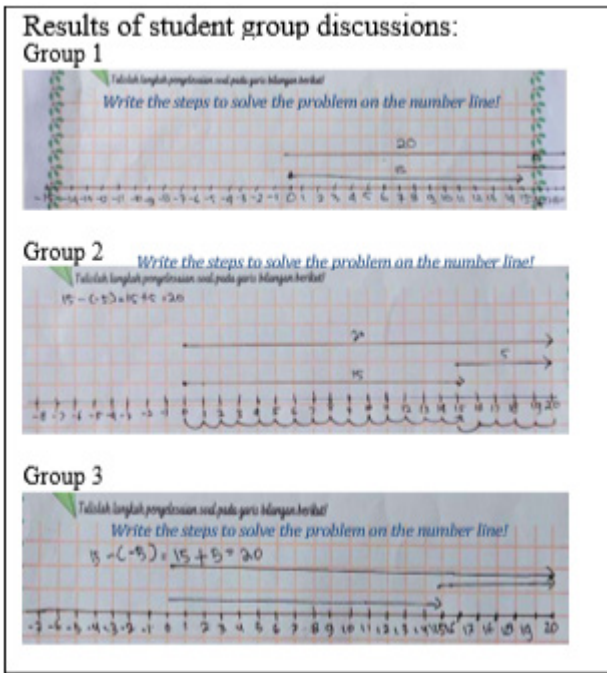


Figure 8. Results of student group discussions

From the results of each group's problem-solving, ELV stated that groups 2 and 3 were able to provide the right answer. Meanwhile, group 1 appears to only describe the answers on a number line. ELV asked group 1 to demonstrate the stages of problem-solving on the "number line banner" media. Through dialogue (dialogue 5), ELV tries to interpret the understanding of students in group 1.



Figure 9. Group 1 demonstrated the stages of problem-solving

Dialog 5

Teacher : What do you understand about the text?

Student 1 : The temperature has changed, ma'am.

Student 2 : The temperature is different ma'am.

Student 3 : -5°C at night and 20°C in afternoon, ma'am.

Teacher : What is the temperature of Mount Jaya Wijaya during the day?

Student 2 : (Observing) 25°C ma'am.

Teacher : How do you determine that?

Student 2 : 20 plus -5 ma'am, it's 25.

Teacher : Can you describe how to get that result?

Student : (Describes the result) Like this ma'am?

Student : (shows the line above 0 to 20) This is 20 plus negative five, so the lines go backward. Oo means the result is 15 ma'am.

Teacher : Which one shows the backward line?

Student 2 : This is ma'am (shows a line above coordinates 15 to 20)

Teacher : (Observing the line drawing shown by the students) If going backward, is the direction the same?

Student : (Observing the picture again) Hmm... no ma'am, the direction is reversed.

Teacher : Why is the direction reversed?

Student : Because the starting point is at 20 if you add negative 5 the direction is opposite, so the temperature of the mountain during the day becomes 15°C .

Teacher : Yes, what if it is written in a mathematical sentence?

Student 3 : $20 + (-5)$ ma'am, so the result is 15.

Teacher : Does anyone have another way?

Student 4 : (Raising hand) I determined a number which, when added to -5 , is 20 ma'am.

Teacher : Please explain how you checked the results.
The temperature during the day is 15°C and the temperature at night is -5°C , so when you add it up the result is 20°C ma'am. By the information in the problem, the rate increase is 20°C .

ELV highlights student stages in solving problems based on student answers on the LKS. Then ELV tries to interpret students' thoughts through dialogue with groups whose answers are unclear. ELV interprets student understanding through questions about what students understand based on information in the text. From the discussion, 3 students gave different answers, this shows that the information analysis process carried out by students on the text was different. ELV interpreted student 3's thoughts about the difference in temperature during the day and night through interpretive questions to explore students' thoughts about the temperature of Mount Jaya Wijaya during the day. From the ELV question, the answer 25°C emerged, and ELV tried to dig deeper into the student's thinking process to get this answer by asking the student to explain his thinking again. Because students still provide incomplete information, ELV asks students to describe it in pictures. ELV does this to stimulate students' creative thinking. When students describe their thoughts through pictures, ELV interprets students' thoughts about what is depicted. Students reanalyzed the image and realized that the temperature of Mount Jaya Wijaya previously presented was wrong, and corrected it to 15°C .

During the interpretation process, students often make mistakes in drawing the direction of the line that represents the number -5 . To help them understand their mistakes, teachers use evaluative questions to guide them in the right direction. ELV also employs further evaluative questions to encourage students to communicate their responses coherently and appropriately. ELV shows the response aspect by presenting other open questions to stimulate students' creative thinking such as "What if written in a mathematical sentence?". From this question, several students expressed different thoughts. Student 3 shows the mathematical sentence $20 + (-5) = 15$, and student 4 shows a different answer, namely $15 - (-5) = 15 + 5 = 20$. Student 4 determines a number that if added to -5 produces 20 to get the number 15, and can explain how to determine the temperature of Mount Jaya Wijaya during the day. ELV helps students connect the strategies students use with different concepts as a form of response. This shows that students 3 and 4 were able to show their creative thinking abilities by giving different answers through the stimuli provided by ELV.

4. Discussion

Based on some empirical evidence regarding elementary teacher noticing skills, it appears that before highlighting special events in learning,

elementary teacher provides an instructional task in the form of a problem for students to solve in groups. Study [41] stated that teaching using problem-based learning combined with simulation methods is effective in stimulating students' critical and creative thinking abilities. The problems given to stimulate students' critical and creative thinking are in the form of open problems. Providing open questions can stimulate students' critical and creative thinking [42], [39]. Elementary school teachers' efforts to stimulate students' critical and creative thinking are very necessary to prepare the nation's next generation to compete globally in the 21st century [43].

4.1. Attending

The attention aspect of elementary school teachers focuses on students' thinking when solving the problems given. The teacher highlights student activities when solving problems through group discussions and based on student work documents. When the teacher finds an answer that is not quite right, the teacher names it as a special event to be interpreted. The teacher highlights the steps and results of problem-solving that students write on student worksheets. The teacher highlights the different answers from each group. Different answers will be interpreted further to obtain information about the details of students' thinking. Based on several events highlighted by the teacher, the teacher carries out an interpretation process by observing in depth the students' answers and asking evaluative questions to explore students' thinking.

4.2. Interpreting

Elementary teachers interpret students' initial thoughts to reveal students' reasons for students' ideas and initial steps. In the interpretation process, the teacher asks interpretive questions whose aim is to open students' thinking and direct students to be able to communicate their thoughts. From the results of the teacher's interpretation activities, the teacher obtains an overview of students' thinking strategies, students' thought processes, and students' unique ideas. When obtaining interpretation results that illustrate students' lack of understanding, the teacher expands the description of the concept to strengthen students' understanding. Based on the results of the analysis and interpretation, the teacher identifies students' needs to determine the responses to be given.

4.3. Responding

The response given by the elementary school teacher is the result of his decision after interpreting the students' thoughts and ideas.

Responses are given based on each student's understanding. From the analysis of students' explanations, teachers provide understanding with new ways of thinking to help students solve problems and come up with unique ideas. The teacher also decided to provide other problems for the next learning process to strengthen students' understanding. Apart from that, teachers also offer new learning strategies to achieve the expected learning goals. The elementary teacher process scheme for stimulating the critical and creative thinking skills of elementary students is presented in Figure 10.

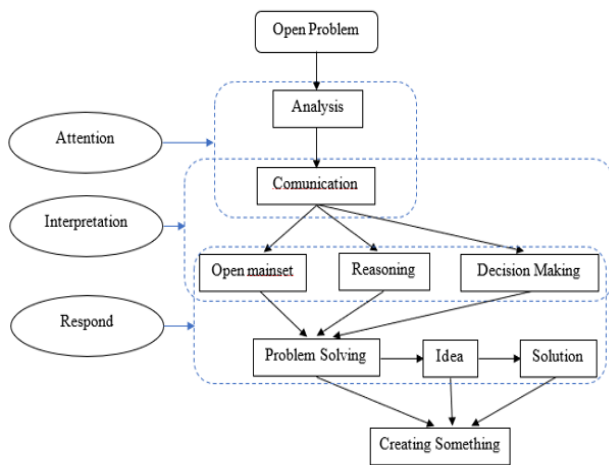


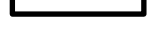




Figure 10. Elementary teachers' scheme to stimulating students' critical and creative thinking (Developed by Restu Lusiana)

Schematic Description

-  : Teacher's process
-  : Student's process
-  : Student's activity
-  : Student's activity group
-  : The Main Aspect of teachers noticing

The scheme of elementary teacher noticing to stimulate students' critical and creative thinking shown in Figure 10 illustrates that the main aspects of noticing namely attending, interpreting, and responding appear as an effort to stimulate students' critical thinking through listening to students' analysis which is communicated in students' dialogues with teachers. Students' ability to think structured influences their critical thinking skills [44], [42]. Stimulating thinking skills using the right method can improve the quality of learning [45].

From the analysis and communication activities, the elementary teacher provides deeper attention to interpret the students' basic thoughts expressed by the students. The activity of listening to students' explanations about what is obtained from the results of the analysis is one of the elementary teachers' efforts to stimulate students' critical and creative thinking. Students are required to think critically and creatively to be able to communicate with others [46]. Creative thinking skills are directly related to problem-based learning [47], [48].

Elementary teachers interpret students' thoughts through interpretive questions as an effort to open students' minds so that students can provide reasons for the steps and ideas used in solving problems, as well as express decisions made by students based on their initial thoughts. The results of the elementary teacher's interpretation of students' initial thoughts are used as a basis for giving responses to students according to the level of understanding of each student. This was done to stimulate students to solve problems, generate ideas, and provide solutions. Giving the right response will involve students in categorizing information, comparing and differentiating ideas and theories, and being able to present and solve problems [49]. Study [50] states that there is a relationship between students' creative thinking skills and students' scientific thinking skills. Students' creative thinking skills are important to develop through effective activities [51]. To stimulate students' critical and creative thinking, the elementary teacher provides descriptive and evaluative questions to bring up creative ideas and unique solutions from students. Giving descriptive and evaluative questions adjusted to the level of understanding and basic thinking of students.

5. Conclusion

Based on the research results, elementary school teachers stimulate students' critical and creative thinking by providing open-ended questions about the concept of integers and operations involving negative numbers. From open problems, elementary school teachers highlight details of students' thinking when analyzing problems and solving problems based on the results of problem-solving written on worksheets. Elementary teachers interpret students' thinking based on important events highlighted to dig deeper into the details of students' thinking strategies in analyzing and solving problems. Based on the results of the interpretation, elementary teachers analyze student needs, and determine the responses to be given. Elementary teachers propose new learning strategies to expand students' understanding of material concepts.

The better the noticing skills possessed by elementary teachers, the more effective the learning strategies designed will be in stimulating students' critical and creative thinking abilities.

The researcher suggests that further study is required to understand teachers' attention to teaching mathematics in the classroom. This study should explore not only how students solve mathematical problems, but also how they think and understand complex problems. Currently, no research examines teachers' attention to students' higher-order thinking abilities in problem-solving, so it is recommended that such research be conducted. The study found that teachers with good attention skills can promote critical and creative thinking in their students. As critical and creative thinking are part of higher-order thinking abilities, the research results can be used to highlight the importance of teachers' attention to these abilities in their students.

Acknowledgment

The authors would like to express gratitude to DRTPM and Universitas Negeri Malang for providing research funding with contract number: 140/E5/PG.02.00.PL/2023 and 20.6.17/UN32.20.1/LT/2023, and to Universitas PGRI Madiun for supporting and being involved in this research.

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