

# Critical reasoning ability of junior high school students on relation and function materials with connecting, organizing, reflecting, extending (CORE) models

*by Ade Muharani*

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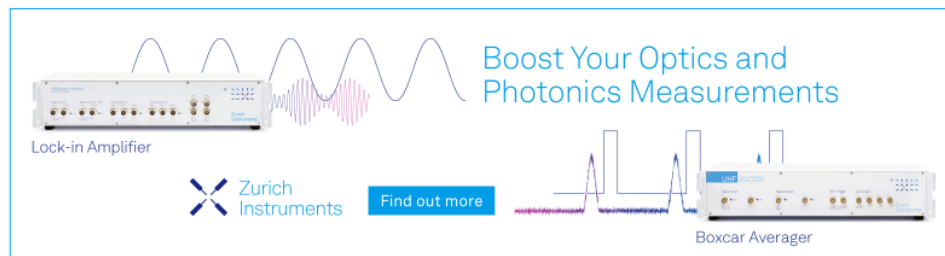
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# Critical Reasoning Ability of Junior High School Students on Relation and Function Materials with Connecting, Organizing, Reflecting, Extending (CORE) Models

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**Abstract.** This research is a research design with a qualitative descriptive type of research that aims to see students' critical reasoning abilities in relation to and function material using a Connecting, Organizing, Reflecting, Extending (CORE) model. Learning will be made by performing activities carried out in class. The activities made are also accompanied by student worksheets (LKPD) to support the learning process. The research subjects were students of class VIII.10 SMP Negeri 8 Palembang while the focus of the study was 6 students with varying abilities, namely high, medium, and low which were selected based on the result of the tests carried out later. The research was carried out in three stages, namely: (1) the Preparation Stage; (2) The Implementation stage of teaching; and (3) The final stage is data analysis. This research was conducted by following the learning system in the school. Data is collected and will be analyzed qualitatively. The result shows the ability to students' critical reasoning abilities in relation to and function material using a Connecting, Organizing, Reflecting, Extending (CORE) model. The indicators that appear the most are indicators that interpret and analyze situations, and applications. Meanwhile, indicators that rarely appear are indicators that make decisions and explanations.

## INTRODUCTION

The development of communication media, science, and technology at this time is very rapid [1]. The government continues to strive to advance and find good methods for change in the world of education [2]. Through circular letter number 1 of 2020, the minister who is a member of the advanced Indonesian cabinet Nadiem Anwar Makarim initiated a new policy, namely the Free Learning Policy [3]. The Independent Learning Policy is a step to transform education for the digitalization of Indonesia's Superior Human Resources (HR) who have the Pancasila Student Profile [4].

The Pancasila Student Profile is one of the efforts to improve the quality of education in Indonesia which prioritizes character building [5]. The Pancasila Student Profile means that lifelong students are competent and have characters according to the values of Pancasila [6]. Students who have this profile are students who are fully awakened from the six dimensions of their formation, namely (1) Faith, fear of God Almighty and noble character; (2) Independence; (3) Working together; (4) Global diversity; (5) Critical reasoning; (6) Creative [7]. One of the dimensions of the Pancasila student profile that is interesting to criticize is critical reasoning. Students who have these dimensions mean that they use their critical reasoning abilities to process information, evaluate, to produce the right decisions in overcoming the various problems they face [7].

However, the dimensions of critical reasoning have not developed optimally in the learning process at school. Based on research conducted by Kibtiyah, the document data of class 5C learning outcomes SDN Pati Kidul 01 showed that some students still had difficulty filtering information, looking for relationships of various information, processing and analyzing, and making conclusions based on that information [7]. According to Azzahra & Amaliyah, there are several reasons why students' critical reasoning is low, namely students' attitudes when learning, students'

understanding when mastering or understanding the material, students' interest in learning, students' intellectual abilities when thinking or solving problems and the role of parents [8].

One of the mathematical subjects taught to class VIII students is relations and functions [9]. The material of relations and functions is one of the important concepts in mathematics that must be taught to students who emphasize reasoning activities [10]. The material of relations and functions is also the basic material to enter the next material such as limit functions, derivatives, and others [11].

There are still many students who have difficulty understanding the material of relations and functions [9]. In a study conducted by Royana et al, which was seen from the results of interviews with the VIII grade mathematics teacher at Kemala Bhayangkari Junior High School (August 13, 2019) it was found that student learning outcomes in relation and function materials were not satisfactory. There are still many students when working on the problem have difficulty in changing the set of consecutive pairs into the form of a Cartesian diagram or other factors in writing symbols for the set of consecutive pairs that are still not quite right [12].

According to Aggreni et al, the factors that cause students difficulty in learning mathematics, relation, and function materials include factors from the student's personality, namely (1) the lack of student interest in mathematics because they think that mathematics is very difficult to understand and full of counting; (2) lack of prerequisite knowledge possessed by students; (3) The lack of student interest in mathematics also greatly affects students in accepting mathematics subject matter in class [13].

An appropriate method is needed to overcome the above problems. The way that can be done is to carry out improvement of the learning process [14]. What we can improve is by using innovative learning model. The mathematics learning model that can condition students to be active in learning mathematics to improve students' critical reasoning skills is the Connecting, Organizing, Reflecting, and extending (CORE) learning model [15]. This is supported by research conducted by Nugraha et al that students will become the center of learning activities so that learning activities will be interesting [16]. The CORE learning model provides space for students to express opinions find solutions and build their knowledge [17]. The CORE learning model is expected to enable students to work cooperatively to solve problem by fostering student skills and stimulating students to learn more independently [18].

Based on the background, the formulation of the problem in this research is how the critical reasoning ability of junior high school students on relation and function materials through the CORE learning model. Based on the background and problem formulation that have been mentioned, this study aims to determine and describe the critical reasoning abilities of junior high school students about and function material through CORE learning.

## METHOD

This research was conducted in class VIII.10 SMP Negeri 08 Palembang Odd Semester Academic Year 2022/2023, with research subjects 6 students. This research is a descriptive qualitative research method. With stages (1) Preparation; (2) Implementation; (3) Data Analysis. At the preparatory stage, the first thing to do is to compile a Research Design and then Choose a Field followed by Managing Licensing and Preparing Assessment Instruments. At the implementation stage, the researcher carried out the learning process in class VIII.10 for 2 meetings by providing material and LKPD regarding material relations and functions through the CORE learning model. During the learning process, observations will be made on the effect of the CORE learning model. At the next meeting, test questions will be given to students to see the emergence of critical reasoning indicators. After the lessons ends, the researcher will conduct interviews with several selected students to confirm the answers and the process of working on the test questions. And lastly, data analysis was carried out by using triangulation techniques, namely by comparing the data obtained including the results of observations, answers to student questions, and interviews. Next, the researcher will conclude how the students' critical reasoning ability after using the CORE model. After that, the researcher will compile a research report.

Data collection techniques were carried out in three ways, namely observation, tests, and interviews. Observations were made to see how the learning process in the classroom used the CORE model. Tests and interviews were conducted to see the emergence of indicators of critical reasoning abilities that emerged in students. The indicators and descriptors in Table 1.

**TABLE 1.** Critical Reasoning Indicators and Descriptors

No	Indicator	Label	Descriptor
1.	Interpreted	A1	- Explain the information contained in the given relationship problem
		A2	- Explaining the information contained in the problem of the given function
2.	Analyzed Situation	B1	- Determine the set contained in the given relation problem
		B2	- Determine the set contained in the given function problem
3.	Applications	C1	- Solve the given relationship problem
		C2	- Solve the problem of representation of the given relation
		C3	- Solve the problem of the given function
4.	Make Conclusion	D1	- Define relationships
		D2	- Determine examples of relationships in everyday life
		D3	- Presenting relationships in various ways
		D4	- Define function
5.	Make explanation	E1	- Provide arguments and reasons why it is called a relation
		E2	- Provide arguments and reasons why to present the relationship in such a form
		E3	- Provide arguments as well as reasons why it is called a function

## RESULT AND DISCUSSION

The research was conducted during two meetings which were conducted directly in class VIII.10 SMP Negeri 08 Palembang. Researchers will act as model teachers and subject teachers will act as observers with the assistance of research partners [19]. At the time of learning, the worksheet students consist of 3 problems using CORE's Model. Then a test is conducted to see how students think critically after learning with the CORE model. Test questions are given after the learning process is carried out. The test questions consisted of two questions regarding relation and function which contain critical reasoning indicators.

### Analysis Test and Interview

Test questions are given to analyze student answers following the indicators of critical reasoning abilities. The question consists of two questions, and for each question, there are indicators to be analyzed. The researcher will analyze student test results by describing whether their answers follow the indicators in the questions [20]. The emergence of critical reasoning indicators for student test answers is as follows:

**TABLE 2.** The Emergence of Critical Reasoning Indicators for Student Test Answers

Indicator	Descriptor	Student's Name					
		AFA	ATA	DKW	FA	KSA	MAA
Interpreted	A1	✓	✓	✓	✓	✓	✓
	A2	✓	✓	✓	✓	✓	✓
Analyzed Situation	B1	✓	✓	✓	✓	-	✓
	B2	✓	-	✓	✓	-	✓
Applications	C1	✓	✓	✓	✓	✓	✓
	C2	✓	✓	✓	✓	✓	✓
	C3	✓	-	-	-	-	✓
Make Conclusion	D1	✓	✓	✓	✓	✓	✓
	D2	✓	✓	✓	✓	✓	✓
	D3	✓	-	✓	✓	✓	✓
	D4	-	-	-	-	-	✓
Make Explanations	E1	✓	-	✓	✓	✓	✓
	E2	✓	-	✓	✓	-	✓
	E3	-	-	-	-	-	✓

### Critical reasoning ability of AFA subjects

AFA subjects are in the high category for critical reasoning abilities because four indicators are met. AFA subjects simply do not meet the indicators on D4 and E3. The emergence of indicators can be seen in the test answers and also in some statements during the interview. Here's the answer to the subject of AFA.

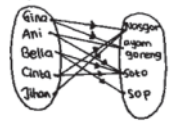
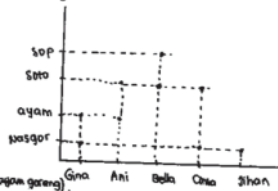
1. a. Himpunan siswa & himpunan makanan yg akan dimasak.  
 b. {Gina, Ani, Bella, Cinta, Jihan}  
 {Nasi goreng, ayam goreng, soto ayam, sop }

} Analyzed Situation

b. K = himpunan ~~hewan~~ ~~jenis~~  
 = {ayam, singa, buaya, ular }  
 = {Mamalia, reptil, unggas }  
 L = Himpunan nama siswa dan pelajaran kesukaan  
 = {Bela, Ade, Ana }  
 = {Matematika, IPA, IPS, Bahasa Indonesia }

} Applications-  
-Make Conclusion-

c. Relasi makanan yang akan dimasak → -Applications  
-Make Conclusion

d. Diagram panah:  
  
 diagram Cartesius:  
  
 Pasangan berurut:  
 { (Gina, nasgor), (Gina, ayam goreng), (Ani, ayam goreng), (Ani, soto ayam), (Bella, sop), (Bella, soto ayam), (Cinta, soto), (Cinta, nasgor), (Jihan, nasgor) }

} Applications-  
-Make Conclusion-

**Translation**

A. the set of students and the set of food to be cooked  
 {Guni, Ani, Bella, Cinta, Jihan}  
 {fried rice, fried chicken, chicken soto, soup} **(Analyzed Situation)**

B. K = set of animal types  
 {chicken, lion, crocodile, snake}  
 {mammal, reptile, poultry}

L = set of student names and favorite lessons  
 {Bela, Ade, Ana}  
 {Math, Science, Social Studies, Indonesian} **(Application, make conclusion)**

C. Relationship of food to be cooked **(Application, make conclusion)**

D. Arrow Diagram Cartesian diagram

Gina	Fried Rice	Soup
Ani	Fried Chicken	Chicken Soto
Bella	Chicken Soto	Fried Chicken
Cinta	Soup	Fried Rice
Jihan		

Gina Ani Bella Cinta Jihan

Sequential pairs  
 {(Gina, fried rice), (Gina, fried chicken), (Ani, fried chicken), (Ani, Chicken Soto), (Bella, soup), (Bella, Chicken Soto), (Cinta, Chicken Soto), (Cinta, fried rice), (Jihan, fried rice)} **(Application, make conclusion)**

FIGURE 1. AFA Answer



It can be seen in the figure that the AFA subject has met the three critical reasoning indicators, even though almost all indicators appear, only in the indicator making conclusions and the descriptor explanation does not appear, namely in the functional material. The AFA subject has to meet indicator interpretation and make explanations when the interview subject could explain what is known and asked about the question and provide an explanation of the answer.

*Critical reasoning ability of ATA subjects*

30 The ATA subject is in the low category for critical reasoning ability because it only shows a few indicators, namely A1, A2, B1, C1, C2, D1, and D2. The appearance of indicators can be seen in the test answers and also in some statements during the interview. Here's the answer to the subject ATA

It can be seen from the picture that the ATA subject only has one indicator of critical reasoning ability, analyzing the situation. And does not have indicators of evaluation, making conclusions, and making explanations. The ATA subject has met the indicator interpreted when the interview subject could explain what is known and asked about the question.

**Handwritten Notes:**

- f. Himpunan A: Jihan: nasi goreng, Gina: nasi ayam, Bella: sop soto
- Himpunan B: (empty)
- B. NAMA HIMPUNAN: sop ayam, nasi soto, nasi ayam
- C. Nasi "Pasia" masakan yang akan dimasak: (empty)
- D. Matching diagram between Set A (Gina, Ani, Bella, Cinta, Jihan) and Set B (nasi Goreng, ayam Goreng, Soto ayam, sop).

**Translation Table:**

A.	Set A	Jihan: Fried Rice
	Set B	Gina: Fried Chicken
		Bella: Soup, Chicken Soto
B.	Name of	Chicken Soup
		Fried Rice
		Chicken Rice
C.	Bella	
	Ani	
	Gina	
	Jihan	
	Rice	Relation "food to be cooked"
D.	A	B
	Gina	Fried Rice
	Ani	Fried Chicken
	Bella	Chicken Soto
	Cinta	Soup
	Jihan	Fried Rice

FIGURE 2. ATA Answer

*Critical reasoning ability of DKW subjects*

The DKW subject is in the medium category because there are three indicators of critical reasoning. The emergence of indicators can be seen in the test answers and also in some statements during the interview. Here's the answer to the subject of DKW.

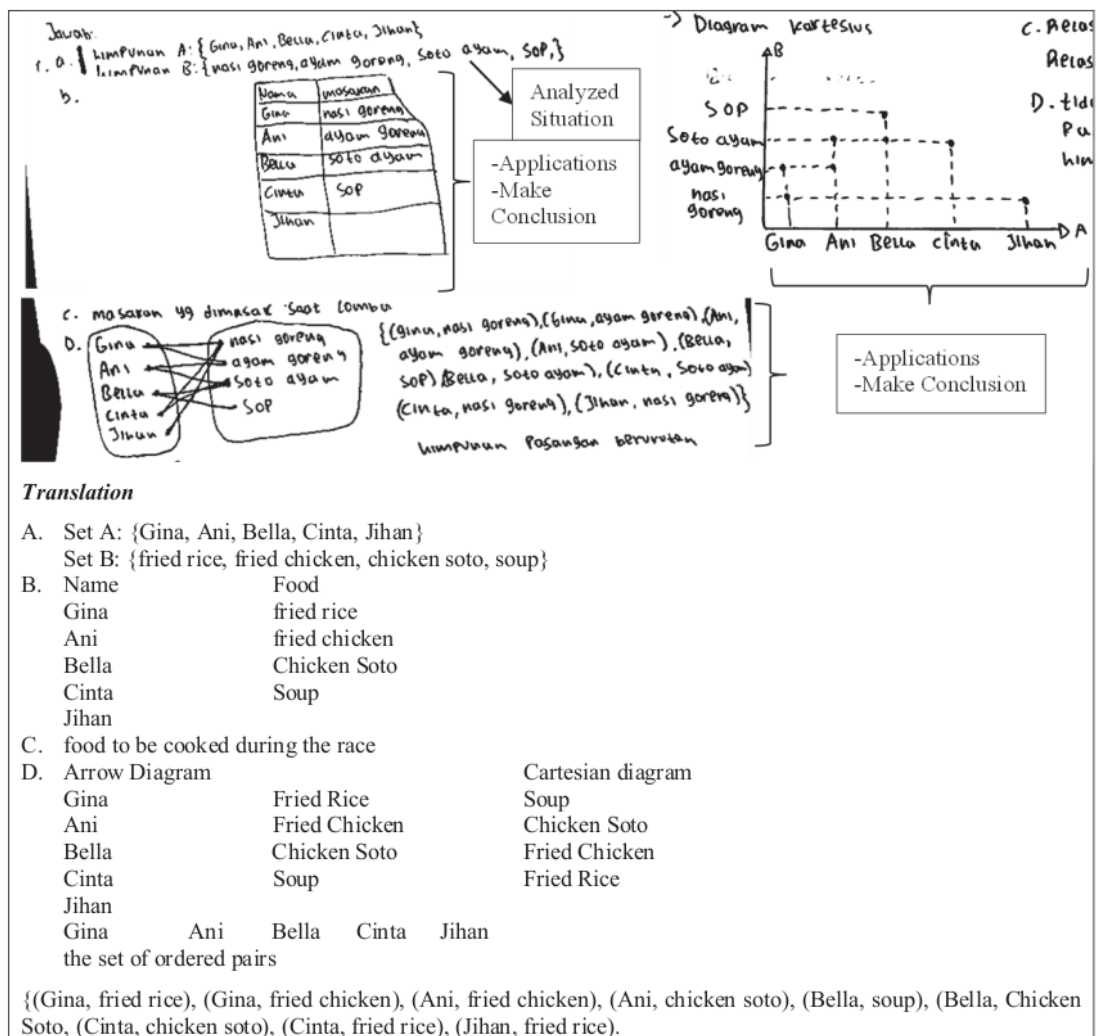


FIGURE 3. DKW Answer

It can be seen in the picture that the DKW subject already has many indicators in critical reasoning, it just bring up the C3, D4, and E3 descriptors. The DKW subject has to meet the indicator interpreted and make explanation when the interview subject could explain what is known and asked about the question and provide an explanation the answer.

#### Critical reasoning ability of FA subjects

FA subjects are in the medium category because they have almost all indicators but do not have descriptors C3, D4, and E3. The emergence of indicators can be seen in the test answers and also in some statements during the interview. Here's the answer to the subject FA.



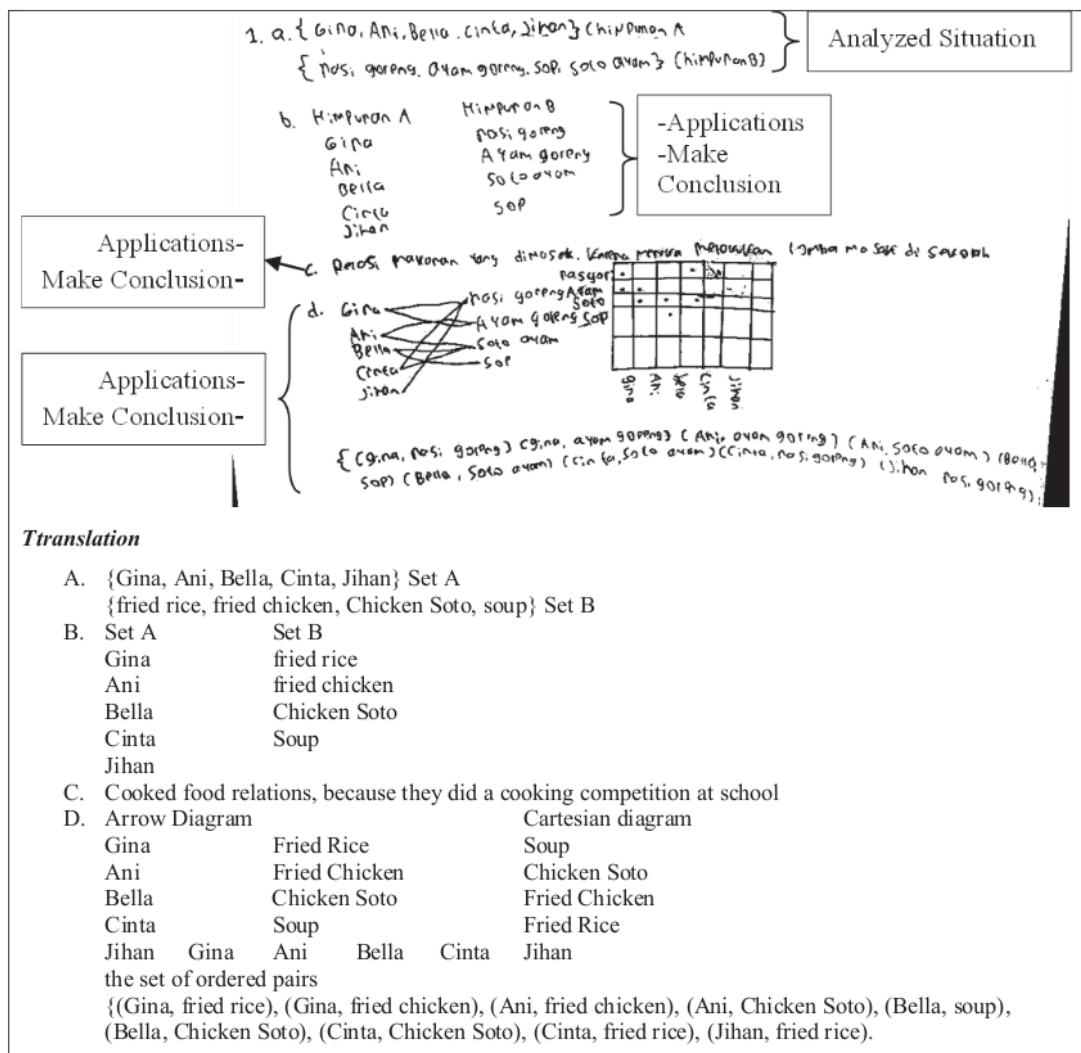


FIGURE 4. FA Subject Answer

It can be seen in the picture that the subject of FA already has many indicators of critical reasoning, they just don't understand the function material. The FA subject has to meet the indicator interpreted and make explanations when the interview subject could explain what is known and asked about the question and provide an explanation of the answer.

**Critical reasoning ability of KSA subjects**

KSA subjects are included in the low category for critical reasoning ability because it only raises two indicators. The emergence of indicators can be seen in the test answers and also in some statements during the interview. The following is the answer to the subject of KSA. It can be seen in the figure that many KSA subjects still do not have indicators of critical reasoning, especially in making conclusions and making explanations. The KSA subject met the indicator interpreted when the interview subject could explain what is known and asked about the question.

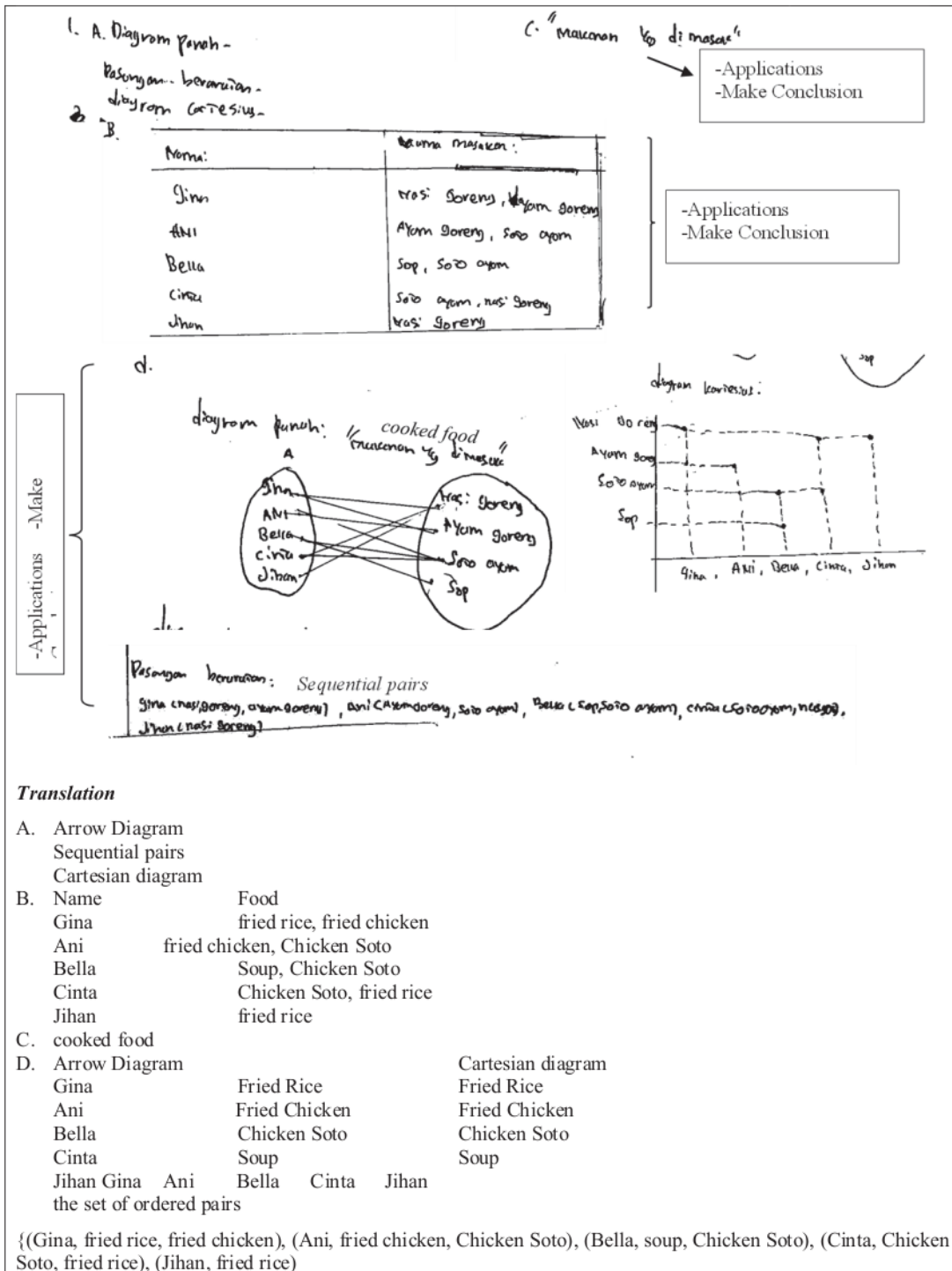


FIGURE 5. KSA Answer

**Critical reasoning ability of MAA subjects**

MAA subjects are categorized as high in critical reasoning because they have all indicators of critical reasoning. The emergence of critical reasoning indicators can be seen in the answers to tests and interviews. Here are the answers to the MAA subject test.

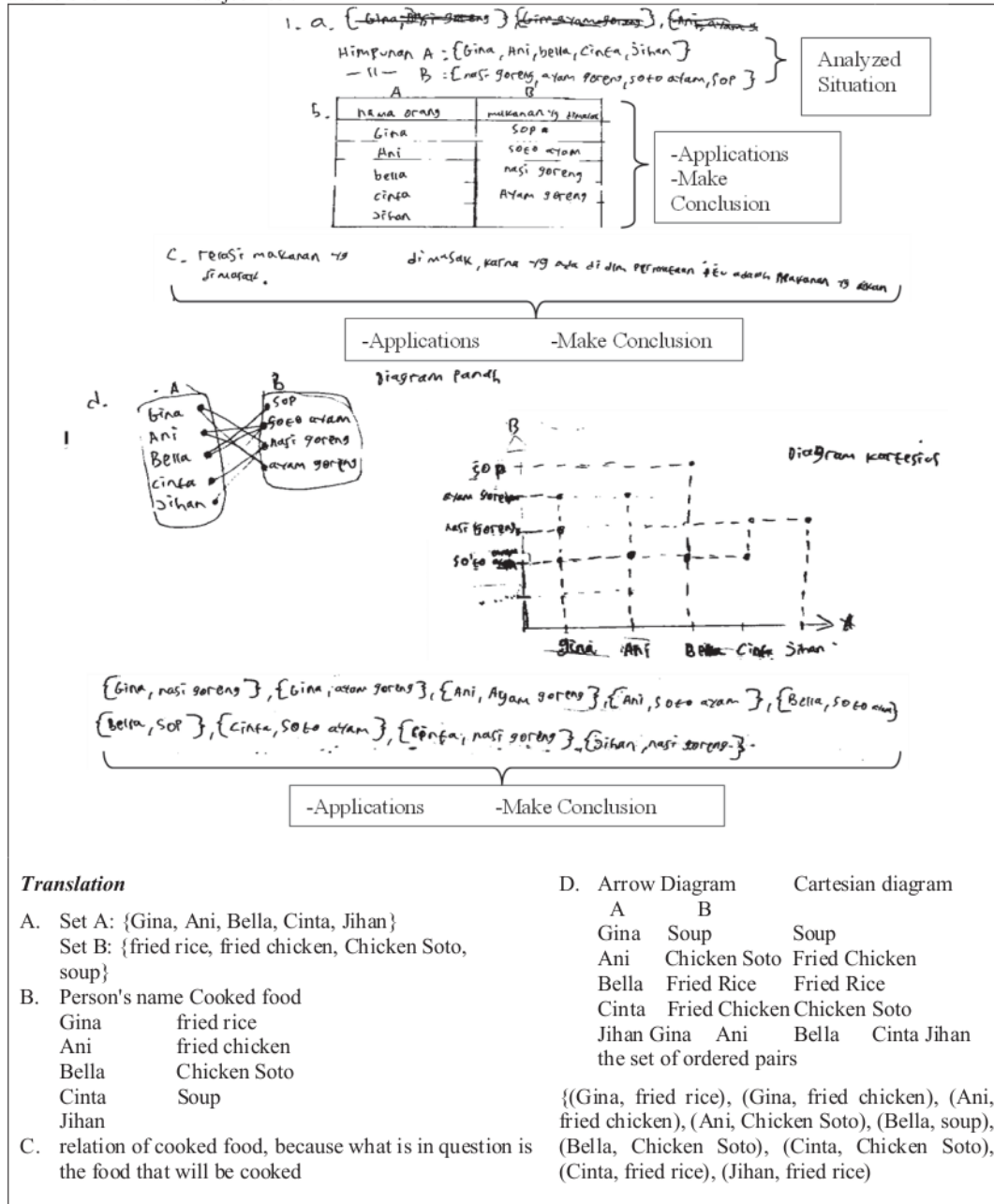


FIGURE 6. MAA Answer

It can be seen in the picture that the MAA has three indicators, analyzed the situation, applications, and conclusions. The MAA subject has to meet the indicator interpreted and make explanations when the interview subject could explain what is known and asked about the question and provide an explanation of the answer. The MAA subject already has all the indicators of critical reasoning for relation and function material with the CORE model.

## CONCLUSION

This study aims to see students' critical reasoning abilities about and function material using a **Connecting, Organizing, Reflecting, Extending (CORE) model**. Based on the results of the analysis, it can unlock problem-solving for most students. The indicators that appear the most are indicators interpreted, analyze the situation, and applications. Meanwhile, indicators that rarely appear are indicators that make decisions and make explanations, this is because students are still less thorough in understanding misconceptions that occur. In this study, several inhibiting factors affect students' answers. Some inhibiting factors include processing time, student accuracy, and student understanding of the material.

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