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COGNITIVE LEVEL PROFILE AT THE TENTH GRADE OF SENIOR HIGH SCHOOL STUDENTS IN MATHEMATICS PROBLEM SOLVING ON THREE VARIABLES OF LINEAR EQUATION SYSTEM MATERIAL

Research Article

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Abstract

Problem-solving is a significant skill in facing the 21st century. Students have different levels of problem-solving. The levels that explain individual abilities in solving mathematics problems are called as cognitive level. It consists of three levels; cognition, metacognition, and epistemic cognition. The cognitive level influences the individual in understanding the problem and deciding the right strategies to solve it. The material used to obtain the data is three variables linear equation system, by involving two high ability students at the tenth grade from one of the state senior high schools in Pati. This research employs a qualitative method in which the data are collected through task-based interview and time triangulation is applied to validate the data. The results reveal that at the cognition level, students with high ability have an understanding related to conceptual and procedural knowledge, but the ability of students in factual knowledge is low, especially in terminology skill; at the metacognition level, the students are able to write down each strategy in each method, but it is not detailed; while at the epistemic cognition level, they are able to explain the weaknesses of a method, but they have not been able to provide a solution to overcome its weaknesses.

Keywords: cognition, metacognition, epistemic cognition, problem-solving, mathematics.

1. Introduction

The development of the 21st century emphasizes the use of communication and information technology in all aspects of life, including in the learning process. According to Kamaleswaran, Rohaida and Rose (2014), in the 21st century, workers must master several fields, such as scientific skill, mathematics, creativity, ability in mastering information technology and communication, and the ability to solve problems. It encourages students to have several skills in facing the 21st century, including communication, collaboration, critical thinking and problem solving, and creativity and innovation or commonly referred as 4C skills. So, problem-solving is one of the crucial skills to deal with life in the 21st century. Students need to exercise solving real problems that require reasoning, clarification, argument or other mathematical skills because it associates in the future that they will be able to contribute improvements in society (OECD, 2010). Problem-solving in learning mathematics can improve students' reasoning. In addition, it can also develop students' tenacity and perseverance. (Sullivan, Borcek, Walker, & Mick, 2016).

Referring to the phenomenon above, the contextual issue must be given to the students in order to meet the demands of the 21st century. In addition, in the 21st century, complex society requires people who are capable of analyzing responding to issues in a constantly expanding knowledge-based world. It needs people who are able to analyze and respond to real-life problems quickly and accurately (Baimba, Brown, & Hardimah, 2008). Presenting a problem to the students meant giving them the opportunity to learn to take risks, to adopt a new understanding, to apply the knowledge, to work in context and enjoy the sensation of being the discoverer (Ali, Hukamdad, Akhter, & Khan, 2010).

According to Polya (1973), the problem is classified into two types, namely (1) problem to find and (2) problem to prove. The set of questions in the form of story is a form of problem to find, namely finding, determining, or obtaining certain values or objects that the information is not known in the problem and fulfilling the conditions that are appropriate to the problem (National Education Department, 2003). The set of questions in the form of story which is used in this study is problem-solving type. Problem-solving type for learning purpose consists of several characteristics, such as the following: (i) challenging (required basic mathematical concepts and knowledge that can be accessed by any mathematician, irrespective of the field of specialization); (ii) the character of the problem would produce a variety of pathways solution, thus giving rise to a variety of cognitive and metacognition behaviors, also prolonged engagement during the solution process; and (iii) a fairly complex problem led to stop and gain strong affective responses (Carlson & Bloom, 2005).

Each student has different abilities in problem-solving. It gives an impact on the cognitive levels of students (Setianingrum, Sujadi, & Pramudya, 2017). Kitchener (1983) stated that students' cognitive level in mathematics problem solving is individual ability level in solving mathematics problems. The definition of cognitive level in this article refers to Kitchener's theory which states that at the first level of cognition (level 1), individual enters into cognitive tasks such as computing, memorizing, reading, perceiving, acquiring language, etc. These are the pre-monitored cognitive processes on which knowledge of the world is built. The second level (level 2), metacognition is defined as the processes which are invoked to monitor cognitive progress when an individual is engaged in level 1, cognitive tasks or goals such as the list above. The third level (level 3) epistemic cognition is characterized as the processes and individuals invoke to monitor the epistemic nature of problems and the truth value of alternative solutions (Kitchener, 1983).

In addition, the researchers also complete the definition of cognitive level with the theory of Anderson & Karthwohl (2001), because the three characteristics of the cognitive level conveyed by Kitchener have in common with the characteristics of the knowledge dimension proposed by Anderson & Karthwohl. According to Anderson & Karthwohl (2001).The dimension of knowledge is divided into four categories, including; first, factual knowledge is knowledge about the basic elements that students must know to learn a discipline or to solve problems in the discipline. Second, conceptual knowledge is the knowledge of the relationship between basic elements in a large structure that enables the elements to function together. Third, procedural knowledge is knowledge about how to do things, practice research methods, and criteria for using skills, algorithms, techniques, and methods. Fourth, metacognitive knowledge is knowledge about cognitive in general and knowledge of self-cognition.

In this study, the cognitive level is described as follows; first, cognition level consists of factual knowledge; conceptual knowledge; and procedural knowledge. For factual knowledge, it includes terminology knowledge and specific element detail knowledge. Conceptual knowledge consists of classification and category knowledge, principle knowledge and generalization, theory, model and structural knowledge. Procedural knowledge includes expertise knowledge and algorithms, knowledge of techniques and specific methods of a subject, and knowledge of criteria to determine the use of appropriate procedures; second, metacognition level consists of strategic and cognitive tasks knowledge; third, the epistemic cognition level includes knowing about the limits of knowledge; belief in knowledge; and criteria for knowing a thing. At the Epistemic cognition level, students are able to explain the sources and problems of knowledge (Knight & Littleton, 2017). In addition, Cognitive level has a lower level than metacognitive level because students have carried out the monitoring and regulating process at the metacognitive level (Kim, Park, More, & Sasha, 2013).

The researchers conduct pre-survey related to cognitive level of a student by taking the material of a three-variable linear equation system, because it enables the researcher to explore the cognitive level at the tenth grade of Senior High School Students. The results of pre-survey show that at the cognition level, students understand conceptual knowledge, but factual and procedural knowledge is still low; at the metacognition level, students have not been able to know the limits of their knowledge in doing a set of questions; and at the epistemic cognition level, students have not been able to provide a way to overcome their weaknesses, and they have not been able to account for the answer scientifically. In the pre-survey conducted by researchers, the chosen subject is students with medium mathematics ability. Then, to get the maximum result about students' cognitive level, the researcher is interested in conducting further research on students' cognitive level in solving mathematics problems for high or low ability students. On this occasion, the researchers focus more on highly capable students in order to find out whether they can fulfill the characteristics of the three cognitive levels that have been mentioned by the researcher or not.

2. Cognitive Level of Mathematics and Theoretical Framework

Data analysis at each level refers to Kitchener's theory and it is completed by Anderson & Karthwohl's theory that has been combined by researchers and it will be explained in Table 1, Table 2, and Table 3.

Table 1. *Indicators for each Type and Subtype of Cognition Level in Mathematics Problem Solving*

A. Factual Knowledge
1. Indicators of terminology knowledge
a. The students are able to write down a replacement symbol of a number which the value is not yet clearly known. Usually, it is symbolized by lowercase letters a, b, c, ... z. b. The students are able to differentiate the symbol of equations and inequality correctly, such as =, ≤, ≥, etc. c. The students are able to distinguish equation, inequality, similarity, and dissimilarity correctly. d. The students are able to identify variables, coefficients, and constants. e. The students are able to distinguish between linear and non-linear.
2. Indicators of specific elements and details knowledge
a. The students explain correctly the known information contained in the set of tasks. (By identifying the information on the set of tasks whether it is enough to answer or not). b. The students are capable to write down the asked information in the set of tasks. (by understanding the materials and steps to answer the given set of tasks). c. The students are able to write down other information (hidden information) needed to answer the set of tasks.
B. Conceptual Knowledge
1. Indicators of category and classifications knowledge
The students are able to classify linear equation and systems of a linear equation.

2. Indicators of generalization and principles knowledge
a. The students are able to explain correctly regarding the criteria (characteristics) of an equation which can be considered as a system of equation. b. The students are capable to write down the general form of linear equation.
3. Indicators of structure, model, and theory knowledge
a. The students are capable to describe a system of linear equations of three variables (by categorizing between linear equation of three variables and not linear equations of three variables). b. The students are able to write down the general form of a three-variable linear equation system.
C. Procedural Knowledge
1. Indicators of algorithms and expertise knowledge
The students are able to mention various methods (substitution method, elimination method, and combination method) used to solve the problem of three-variable linear equation system.
2. Indicators of specific methods of a subject and technique knowledge
a. The students are able to explain and write down the operation technique of a number correctly, including addition, subtraction, multiplication, and division. b. The students are able to explain and write down substitution, and elimination techniques, etc.
3. Indicators of criteria to determine the use of appropriate procedures knowledge
The students are capable to choose the most appropriate method to solve the problem of three-variable linear equation system, and the subjects are also able to provide a reason scientifically.

The characteristics at the cognition level which is described in Table 1 are reinforced by the opinion of other researchers, including; According to Reed (2004), cognition is the acquisition of knowledge. Benjafield (1992) states that cognition is learning to understand knowledge. Sternberg (2006) views that cognition is an understanding of knowledge or the ability to acquire knowledge. According to Berger & Luckmann (2005), cognition is an individual's belief about something that is obtained from the process of thinking. The process is intended to acquire knowledge and manipulate knowledge through the activity of remembering, analyzing, assessing, reasoning, and imagining. Meanwhile, the indicators of problem-solving at the metacognition level will be explained in Table 2.

Table 2. *Indicators for each Type of Metacognition Level in Mathematics Problem Solving.*

1. Indicators of strategic knowledge
The students are capable to provide concrete reasons or considerations when choosing a combination method, or substitution method, or elimination method.
2. Indicators of cognitive tasks knowledge
a. The students are capable to explain well the time usage and the reason in using the strategy of combination method. b. The students are able to explain well the time usage and the reason in using the strategy of substitution method. c. The students are able to explain well the time usage and the reason in using the strategy of elimination method.

Table 2 explains indicators at the epistemic level adopted from Kitchener, Anderson, and Karthwohl's concept. The indicators are in line with the statement of Kuhn & Dean (2004) explained that metacognition caused learners who have been taught with a certain strategy and in the context of particular problems would be able to obtain and use a new strategy for the same context. Metacognition also concerned with knowing how to reflect, to make conclusions on the analysis, and to apply in practice. In other words, metacognition also how to have cognitive tasks were important as remembering, learning, and problem-solving (Downing, 2009). Furthermore, indicators of problem-solving at the epistemic cognition level are explained in Table 3.

Table 3. *Indicators for each Type of Epistemic Cognition Level in Mathematics Problem Solving*

1. Indicators of knowing about the limits of knowledge
a. The students are able to describe well the steps in each method that they have been chosen, such as the effectiveness of the method, etc. b. The students understand the advantages and disadvantages of the method.
2. Indicators of confidence in knowledge
The students are confident in working on a question. (By providing concrete reasons about the answer).
3. Indicators of criteria to know
a. The students are able to explain scientifically the reason in choosing the used strategy. b. The students understand the strategy and solution to overcome the faced problems.

Table 3 explains indicators at epistemic level adopted from Kitchener, Anderson, and Karthwohl's concept. The indicators are in line with the statement of Chinn, Buckland, & Samarapungavan (2011), research on individual cognition on epistemic problems has become a major topic in the world of education and psychological development, cognition on topics which related to knowledge, sources of knowledge, belief in knowledge, and evidence underlying these beliefs.

Epistemic cognition is the way in which the individual understands the certainty, simplicity, source, and justification concepts of knowledge (Mason, Boldrin, & Ariasi, 2009). According to Hofer & Pintrich (1997) in Ferguson, Brathen, & Stromso (2012), epistemic cognition is a form of personal epistemology that relates to the opinion and understanding of individuals about knowledge and the process of gaining knowledge.

3. Method

This study employs a qualitative method. The main data in this study are written words and interview results related to students' ability in solving mathematics problems. The research subjects are taken from two high-ability students at the tenth grade of one of the State Senior High School in Pati, who are given the initial of Subject A and Subject B. In collecting the data, the researchers use task-based interviews. The supporting instruments used in this study are a set of tasks related to the linear equations system of three-variable and interview guidelines. Budiyono (2003) states that the interview is a way of collecting data through conversations between researchers and students or data sources. The set of tasks about linear equations system of three-variable are used to identify students' cognitive level in solving mathematics problems. Then, time triangulation is applied to validate the data. According to Patton in (Moleong, 2007), time triangulation is comparing and re-examining the trust degree of information obtained through different times. Data analysis technique is Miles and Huberman’s technique, which include data reduction, data presentation, and conclusions or verification. Data analysis is carried out by analyzing the results of interview based on the set of tasks in solving the problem of three-variable linear equation system.

4. Finding and Discussion

Based on the results of written work, the first and second interviews, then the researchers analyze and compare it in order to find the valid data. After that, the data is intended to find out the cognitive level of students in solving mathematics problems.

4.1. Cognition Level

In this study, cognition level is defined by three knowledge, including; factual knowledge; conceptual knowledge; and procedural knowledge. The explanation of the three-knowledge is presented in Table 4, Table 5, and Table 6.

Table 4. *Factual Knowledge Type of Cognition Level*

Valid Data of Subject A	Valid Data of Subject B
1. He is able to write down a substitute symbol of a number which the value is not yet clearly known.	1. He is able to write down a substitute symbol of a number which the value is not yet clearly known.
Example: Subject A and Subject B write down the symbol x = the price of children's jacket, the symbol y = the price of teenager's jacket, and symbol z = the price of adult's jacket.	
2. He understands the differences between symbols of equality and inequality.	2. He understands the differences between symbols of equality and inequality.
Example: Both subjects explain the differences between the symbols of equation and inequality correctly	
3. In the first and second data collection of Subject A, he is able to write down the differences between equation, inequality, similarity, and dissimilarity. However, there are deficiencies in defining inequality and dissimilarity.	3. In the first data collection, he is wrong in writing the differences between equation, inequality, similarity, and dissimilarity. Then, in the second data collection, he has been able to differentiate, but there are deficiencies in defining inequality and dissimilarity.
Example: Both subjects write down the differences between equation, inequality, similarity, and dissimilarity. However, there are deficiencies in defining inequality and dissimilarity. Inequality uses the sign (>, ≥, ≤, <) while dissimilarity only uses the sign (≠).	
4. He can identify variables, coefficients, and constants correctly.	4. He can identify variables, coefficients, and constants correctly.
Example: There is an equation system 10x + 40y = 4,700,000. Subject A and Subject B mention that number 10 and 40 are coefficients, letter x and y are variables, and number 4,700,000 is constants.	
5. He is able to distinguish between linear and non-linear correctly.	5. He is able to distinguish between linear and non-linear correctly.
Example: The answer of subject A is linear when the equation contains of a variable with one squared or if it is drawn graphically, it will form a straight line. Non-linear means that it is not a requirement of the linear equation. Subject B gives a wrong definition of linear and non-linear, then subject B spontaneously justifies it correctly in line with the answer of subject A.	
6. He is able to explain correctly the known	6. He is able to explain correctly the known

Valid Data of Subject A	Valid Data of Subject B
information presented in the set of tasks.	information presented in the set of tasks.
Example: Subject A mentions the information in the set of tasks in a coherent way, and the information can solve the problem. Subject B explains all of the known information in the set of tasks, and he proposes that the known information in the set of tasks has not been able to answer the tasks because there is still the unknown value of the tasks, namely the rest of the jacket	
7. He is able to search for the hidden information in the set of tasks, and he is able to answer correctly when there is no hidden information.	7. He is able to search for hidden information in the set of tasks, and she is able to answer correctly when there is no hidden information.
Example: Subject A and subject B answer that the remaining jacket is the hidden information on the task	

Based on Table 4 which explain the factual knowledge type of cognition level in detail between subject A and Subject B, it can be concluded that students with high ability master the knowledge of terminology, detailed knowledge and specific elements in the problem of three-variable linear equation system. However, they still do not understand the symbol used to distinguish between inequality and dissimilarity.

Table 5. *Conceptual Knowledge Type of Cognition Level*

Valid Data of Subject A	Valid Data of Subject B
In the first data collection, subject A does not know the characteristics of three variable linear equation system. However, in the second data collection, he is able to explain it correctly.	He is able to classify and convey the characteristics of a linear equation and the systems of linear equations correctly.
Example: Subject A and subject B are able to describe characteristics, definitions, and general forms of linear equations and linear equation systems correctly	

Based on Table 5 above, related to the conceptual knowledge of cognition level type, it can be concluded that students with high ability are able to describe characteristics, definitions, and general forms of linear equations and linear equations systems correctly. But there are interesting things in collecting data on subject A. There is differentiation in the first and second data collection. The differentiation can be seen when subject A is asked to classify and describe characteristics between linear equations and systems of linear equations. In the first data collection, subject A has not been able to answer correctly. Meanwhile, in the second data collection, she is able to answer correctly. It is caused by the enthusiasm possessed by the subject A. He is trying to find an answer that makes him satisfied or answers that are in accordance with the truth when the subject A felt less satisfied in answering the question. This is in agreement with research conducted by Cleopatra (2015) which shows that the results of learning motivation influence mathematics learning achievement significantly up to 93.1%. Students who have high math skills will also have high learning motivation. Meanwhile, subject B is able to provide answers that are close to the truth.

Table 6. *Procedural Knowledge of Cognition Level*

	Valid Data of Subject A		Valid Data of Subject B
1	He is able to mention and solve problems of three-variable linear equation systems using three methods, namely; combination method; elimination; and substitution.	1.	He is able to mention and solve problems of three-variable linear equation system using three methods, namely; combination method; elimination; and substitution.
	Example: Subject A and subject B solve the given problem using three methods, including; combination method; elimination; and substitution.		
2	He has a good understanding of the operation techniques of a number.	2.	He has a good understanding of the operation techniques of a number
	Example: Both subjects are able to write down and explain the operation technique of a number, including, multiplication, division, addition, and subtraction.		
3	He is able to give reasons for choosing a combination method as the most appropriate method. In the first data collection, the reasons given are non-scientific, then in the second the data collection, the reasons are given are scientific.	3.	He is able to give reasons in choosing a combination method as the most appropriate method. In the first data collection, the reasons given are non-scientific, then in the second the data collection, the reasons are given are scientific.
	Example: The most appropriate method according to subject A is combination method, because he prefers to apply the combination method rather elimination and substitution method. Meanwhile, subject B is in line with subject A, he states that combination method is the most appropriate method since it is easy to apply, it is less complicated, and it does not require a long time.		

Based on Table 6 above, the conclusion can be drawn that on procedural knowledge, Subject A and B are able to mention and complete the problem of three-variable linear equation systems with several methods. They also have a good understanding of the operation techniques of a number. However, there is something important when they choose a combination method as the most appropriate method. In the first data collection, the reasons given in choosing the method are non-scientific, then in the second data collection, the reasons given are scientific, so it can be concluded that they are able to provide the right reasons in choosing combination method. This is in accordance with the theory, that the higher the student achievement motivation, the better their academic performance will be (Sugiyanto, 2009). Furthermore, achievement motivation is considered as a preference for high standards of performance or as the willingness to work hard and persistently to rich these standards (Sciefele & Csikszentmihalyit, 1995).

4.2. Metacognition Level

Metacognition level is characterized by two knowledge including; strategic knowledge; and knowledge of cognitive tasks. The explanation is summarized in Table 7.

Table 7. *Metacognition Level*

Valid Data of Subject A	Valid Data of Subject B
He is able to write down a strategy for each method, but it is still not specific. So the reason for choosing a particular method is also less specific.	He is able to write down each strategy for elimination, substitution, and combination method. However, the details are lacking, so the reason for choosing a particular method is also lacking in detail.
Example: The strategy used in the combination method of subject A is eliminating one by one variable until it finds one of the variable values, then the value is substituted into the other equation. Meanwhile, the strategy employed in the elimination method is eliminating one by one variable. For Substitution method, subject A applies one of the variables value into another linear equation to find out the value of another variable. The strategy employed by Subject B in the elimination method is removing one of the variables in the linear equation system to find out the value of other variables. In the substitution Method, subject B enters the value of one variable in a linear equation. For the combination method, he combines the elimination method and the substitution method.	

Based on Table 7 which explains in detail about metacognition level between subject A and Subject B, it can be drawn a conclusion that Subjects with high ability are able to write down each strategy on elimination, substitution, and combination method. However, the details are lacking, so the reason for choosing a particular method is also lacking in detail. Because the students only work according to the way the teacher does, without understanding the strategy for what method are like. This is in accordance with Bandura's theory. Previous studies confirmed that at least partly of many behaviors can be learned through modeling. Some examples that can be cited on this regards are, students can watch parents read, students can watch the demonstrations of mathematics problems, or seen someone acting bravely and fearful situation (Bandura, 2006).

4.3. Epistemic Cognition Level

In this study, epistemic cognition level is characterized by three indicators including; knowing about the limits of knowledge; belief in knowledge; and criteria for knowing. The three indicators were explained in Table 8 below.

Table 8. *Epistemic Cognition Level*

Valid Data of Subject A	Valid Data of Subject B
1 He is able to explain the steps in the chosen method, and he is able to explain the weaknesses of the methods that are less-controlled by him.	1. He is able to explain the steps in the method he chooses and be able to explain the weaknesses of the methods that are less controlled by him.
Example: Subject A answers the substitution and elimination method is not appropriate because the equation made in the substitution method has a lot of numbers, such as x = 470.000 - 4y and z = 570,000 - 4y; in my opinion, it is too complicated. Meanwhile, in the elimination method, subject B answers it in complicated and many ways, in this way we have to find some more equations then we will find one of the variables. Therefore, I consider this method is ineffective and require a long time. In my opinion, subject B should eliminate one of the variables in order to produce a new equation, and then he	

	Valid Data of Subject A		Valid Data of Subject B
	eliminates it again with another equation. The accuracy is needed.		
2	The solution provided to overcome its weaknesses is still unscientific.	2.	The solution provided to overcome its weaknesses is still less unscientific.
	Example: Subject A overcomes weaknesses through researching another answer sheet by recalculating the questions given. Subject B answer that he had to study diligently to understand, get used to working on the system of three-variable linear equation system with methods that he did not master yet. It needs more concentration and needs more accuracy when working on a three-variable linear equation system.		
3	He is able to explain scientifically the use of each method. However, the first and second data collection has different substances. In the first data collection, all the reasons given in choosing the method are still unscientific. In the second data collection, the reason given is scientific.	3.	He is able to explain scientifically the use of each method.
	Example: Subject A answers that each method can be used; combination method on complex numbers (which are difficult or it cannot even be simplified), elimination method is used when there are the same coefficients in the same variable, the substitution method is in a number that has a simpler value and one variable value is known. Meanwhile, subject B answers that elimination method can be used when there are two equations to eliminate one variable. The substitution method is used when there is a known value of the variable then substitutes it into another equation. The combination method is used when the variables don't provide the information in the two linear equations, so we must eliminate two equations until we get the value of one of the variables and then substitute it into other equations.		

Based on Table 8 which describes in detail the epistemic cognition level between subject A and Subject B, it can be concluded:

1. Subjects with high mathematical abilities are able to explain the steps in the method they choose, and they are able to explain the weaknesses of the methods.
2. Subjects with high mathematical abilities have not been able to provide solutions in overcoming their weaknesses in the method that they do not mastered yet.
3. In explaining the use of each method, there are differences in the first and second data collection of subject A. In the first data collection, subject A has not been able to provide answer scientifically. Meanwhile, in the second data collection, he has been able to provide answer scientifically. This is an evidence of enthusiasm possessed by the subject A. When the subject A feels less satisfied in answering the question, he tries to find an answer that makes him satisfied or answer that is in accordance with the truth. This is consistent with research conducted by Ameliah, Munawaroh, and Muchyidin (2016) which states that students' curiosity has an influence on the ability of their learning outcomes with a significance of 0.009 <0.05. Students who have high learning ability will have a high curiosity. So, it can be concluded that subject A and subject B are able to provide a scientific answer.

5. Conclusion

Based on the results and discussion, it can be concluded that the cognitive level of students with high mathematics abilities in solving problems as follows; at the cognition level, the subjects master terminology skills, but they have not been able to distinguish the marks between inequality and dissimilarity. At this level, the subjects also master conceptual knowledge and procedural knowledge well; at the level of metacognition, the subjects are able to write down each strategy in each method, but they could not explain it in detail form. As a consequence, the reason for choosing a particular method is also less detailed, because students rarely explain the strategies on their work; at the epistemic cognition level, the subjects are able to explain the weaknesses of the method that they have not mastered yet, but they have not been able to provide the right solution related to its weaknesses. Related to the use of each method, the subjects are able to provide answers scientifically.

The interesting thing in this study is the high-ability subjects have a high curiosity and motivation. It can be seen in several instances in the first and second data collection. In the first data collection, the results are different from the second data collection. Subjects answer incorrectly in the first data collection, but they are able to answer correctly in the second data collection. Furthermore, Students who have high abilities will also have a high curiosity. This is consistent with research conducted by Ameliah, Munawaroh, and Muchyidin (2016) which states that students' curiosity has an influence on the ability of their learning outcomes with a significance of 0.009 <0.05. Students who have high learning ability will have a high curiosity.

There are several suggestions for the readers, including; students should be given a treatment to remember the definition and scope of the material that they have learnt, so that they can understand well the small points that exist in the material, such as symbols of equation, similarity, inequality, and dissimilarity. Anderson & Karthwohl (2001) state that initial knowledge such as terminology knowledge is very useful and specific, so the experts expect that the students master it; students must be accustomed to working with various methods, so that they will be easier in finding various solutions to solve a problem; students must recognize strategies in solving a problem, so that they were able to solve a problem coherently; students also always be motivated to overcome their weaknesses or weaknesses in dealing with a problem. This research is conducted by researchers focusing on high-ability students and in pre-survey with medium-ability student with three-variable linear equations system material. Therefore, it is necessary to conduct further research on students' cognitive levels with other criteria.

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