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Defragmenting Of Thinking Process Through Cognitive Mapping To Fix Student's Error In Solving The Problem Of Algebra

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Abstract

This research have purpose to give a description how the *defragmenting* of thinking process through cognitive mapping that could fix student's error in solving the problem of algebra. The research was conducted on Grade VIII MTS Surya Buana Malang already taking material of linear equations. Students are given an algebraic problem then taken 6 people who serve as research subjects. Data collection was performed by the method of think-out-loud. The data obtained is then encoded and used as a basis to describe the process of *defragmenting* is done. From the results of the study found that students' errors in solving algebra problems is wrong in understanding the problem, not able to change the word problems into mathematical sentence, and mistake when doing algebraic equations complete the operation. *Defragmenting* conducted by researchers is to create *disequlibration* by asking students whether or not certain of the answer, provide *cognitive conflict* by giving students completed about one linear equations with two variables if students can find a solution, and provide *scaffolding* by asking students to interpret the word equation and transforming into a mathematical sentence that compose a linear equation and ask the students to check the age of the already obtained substituting into the old and new formula.

Key Words: *Defragmenting*, Student's Error, Cognitive Mapping, Problem Solving, Algebra.

In recent years many researchers who study about students' difficulties and errors in solving math problems (Bingolbali, Akkoc, Ozmantar, and Demir, 2010; Gal and Linchevski, 2010; Shein, 2012; Subanji, 2007). From these results, obtained some findings, among others: the occurrence of a mistake to think that is not true (pseudo) kovariasional reasoning starts from the imperfection of the process of assimilation and accommodation resulted in the formation of structural imperfections thinking (Subanji, 2007), the difficulty of students in the representation of geometry can be seen by using a three-phase visual perception and representation of the organization's knowledge, recognition, and representation (Gal and Linchevski, 2010), the gesture of the teacher can help the student difficulties in geometry (Shein, 2012), and differences in the views of teachers on student math difficulties affect the process learning (Bingolbali, Akkoc, Ozmantar, and Demir, 2010).

Zakaria Ibrahim, and Maat (2010) describes three types of errors students in solving mathematical problems, namely errors in understanding the problem, the error in the process of transformation, and the error in using the skills of problem-solving abilities. Errors made by the students due to their difficulties in learning mathematics. Difficulties students may be caused by the teacher. Bingolbali, Akkoc, Ozmantar, and Demir (2010) in his study revealed that the difficulties experienced by students is often caused by negative attitudes, incompetence, lack of knowledge, and lack of effort from the teacher. Confirmed by them that teachers who do not have sufficient competence, often blaming the students and make students more difficulty and failure in learning metematika.

Mistakes are often made by students in solving algebra problems. Lian and Idris (2006) found three common mistakes made when students solve algebra problems, namely 1) the error in finding the pattern; 2) errors in the process of generalizing the formula using algebraic symbols; and 3) errors in applying the formula in solving the problem. Seng (2010) found 12 types of mistakes made by students when solving algebra problems and errors in general is divided into two, namely procedural errors and conceptual errors. Lian and Yew (2012) conducted a study on the development of algebra problem solving abilities of students and found that there are four levels of algebraic problem solving abilities, namely 1) unistructural, 2) multicultural, 3) relational, and 4) extended abstract.

Algebraic problem solving skills possessed by the students is very important to remember the importance of algebra. Although the algebra is a branch of mathematics that is most daunting for students (Radford, 2012), but the mastery of this material to be decisive for the students and play an important role in facilitating others to study mathematics (Carraher, Schlieman, Brizuela and Earnest, 2006). Given the importance of algebra, students need to be taught how to have the right mindset in solving algebra problems. Mistakes are often made by students when solving problems of algebra shows that there are still many students who have not done the right thought process. The study also reinforced by the observation of the researchers who conducted in MTS Surya Buana Malang when giving solving algebra problems still many students who make mistakes. This is due to the weakness of the students algebraic concepts as algebra teacher when explaining the material more emphasis on procedures in the work on the problems rather than the concept. Therefore, it is necessary to restructure (defragmenting) thinking processes to correct errors made by students in solving algebra problems.

Defragmenting or restructuring of students' thinking processes in solving algebra problems is assessed through cognitive mapping. Jonassen (in Rumate, 2005) defines cognitive mapping as a technique to describe the structure and relationships between ideas or concepts in the mind of an individual. Ackerman, Eden, and Cropper (2004) defines cognitive mapping as a technique to make the process of structuring, analyzing, and making the perception of the problem. The results of the so-called cognitive mapping cognitive maps (Pena, Sossa, Guterres, 2007). Cognitive mapping is different from the concept mapping. Concept mapping shows a hierarchy, namely the mapping starts from the general to the specific or general ideas leading to sub-smaller ideas. While cognitive mapping does not consider the factor hierarchy. The mapping is done by the student in accordance with the sequences of thinking when encountering the problem to find a solution of the problem. Restructuring process of thinking (defragmenting) through koginitif mapping is expected to improve students' errors in solving algebra problems.

Based on the description above, the researcher is interested in conducting a study entitled "Defragmenting Process Thinking through Cognitive Mapping to Fix Students in Algebra Problem Solving." Goal to be achieved in this research is to obtain a description of the defragmenting process of thinking through cognitive mapping that can correct errors in the students' solve algebra problems.

METHOD

This research was a qualitative exploratory. This study will reveal how the restructuring (defragmenting) the process of thinking through cognitive mapping (cognitive mapping) to correct errors the students in solving algebra problems. Given algebra problems related variables on the use, understanding of the operations and equations, and skill in making the relationship as well as the ability to model word problems into algebraic form. Troubleshooting seen from the behavior of students in solving algebra problems.

The instrument of this research is guided by the researcher's own instrument assignment sheet to solve algebra problems. In this case the researchers are planning, implementing data collection, analysis, interpreter of data, and eventually became a pioneer of research results. Excavation data through interviews conducted with unstructured interviews. This interview is used to find information that is not standard and to further explore an issue that needs to be emphasis on irregularities, unusual interpretation, reinterpretation, or a new approach. In an unstructured interview, the question was not arranged in advance, but tailored to the unique circumstances and characteristics of the respondents.

This study was conducted in MTS SOLAR BUANA Malang in the second semester of 2013/2014 to students who "have" material algebra linear equations. Chosen students who have received the material on the grounds that the matter was still stored in their memory. Subjects selected based on purposive sampling, which is taken by considering the ability of communication to the disclosure of the thinking process can be done well. Researchers plan to take 6 samples as research subjects based on student's ability level (low, medium, and high respectively 2). Determination of the subject as is expected of each subject can be a representative who can describe the actual conditions in the field. Determination of categories of mathematical skills of students based on the results of student work based on the given problem, and input from teachers of math and homeroom.

In this study, students were asked to convey loud what he was thinking (Think Out louds), when solving problems. Upon completion students gain, researchers grouped the students' answers to the correct answers and wrong answers. Students who answer correctly the way algebra is not used as research subjects because researchers focus only on students who are experiencing an error in answering algebra problems.

The process of data collection in this study using a task-based interview, in which subjects were given a paper and pencil to do some tasks, asked to explain in detail what they are doing, discuss why infer it and other possibilities. Subsequently conducted interviews, observation, and documentation with the tape recorder.

The process of data analysis in this study is done with the steps: (1) examine all data available from various sources: from the interview; observations that have been written in the field notes; and results of algebraic problem solving; (2) conduct data reduction by making abstraction. Abstraction is a summary of the core businesses create, process, and statements that need to be maintained to remain in it; (3) arrange the units further categorized by making coding; (4) an inspection of the validity of the data; (5) analysis of interesting things; and (6) interpretation of the data / conclusions.

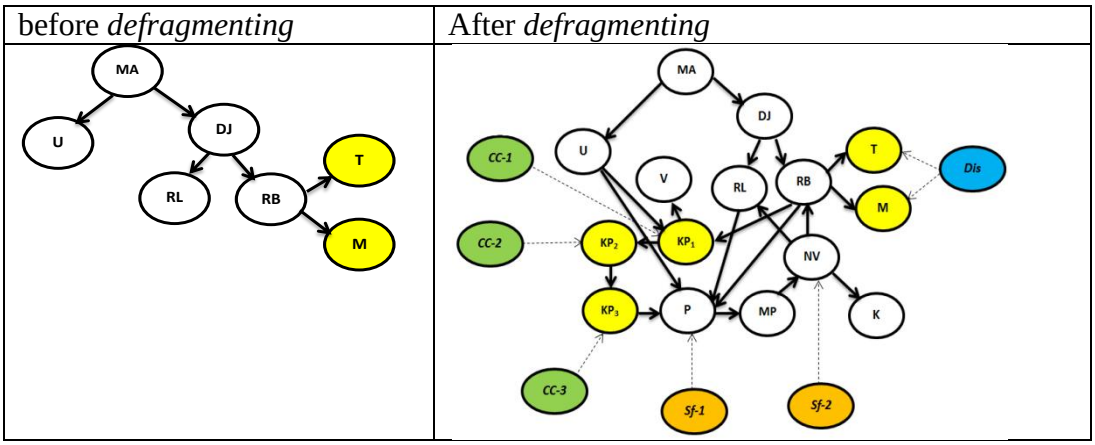
RESULTS

This study describes the thinking of students in solving algebra problems, the thought process that describes the relationship between cognitive activity of students as seen from the steps of their work in solving algebra problems and defragmenting is done by researchers in an effort to improve students' errors in solving algebra problems. For the 3 groups of subjects presented research that has different character, namely the low-ability students (Subject 1 (S1) and Subject 2 (S2)), a group of students who are capable (subject 3 (S3) and subject 4 (S4)), and a group of high-ability students (subject 5 (S5) and subject 6 (S6)).

The thought process of students exposed to a given algebra problems on heart rate. Description of the process of thinking of each student is presented both before and after defragmenting of researchers. Furthermore, also described the structure of thought or cognitive map algebra students in solving problems before and by defragmenting compared with the structure of the given problem.

1. Thinking Process Description S1 in Algebra Problem Solving

The following diagram illustrates the difference or change in the structure of thinking S1 before with after defragmenting process.



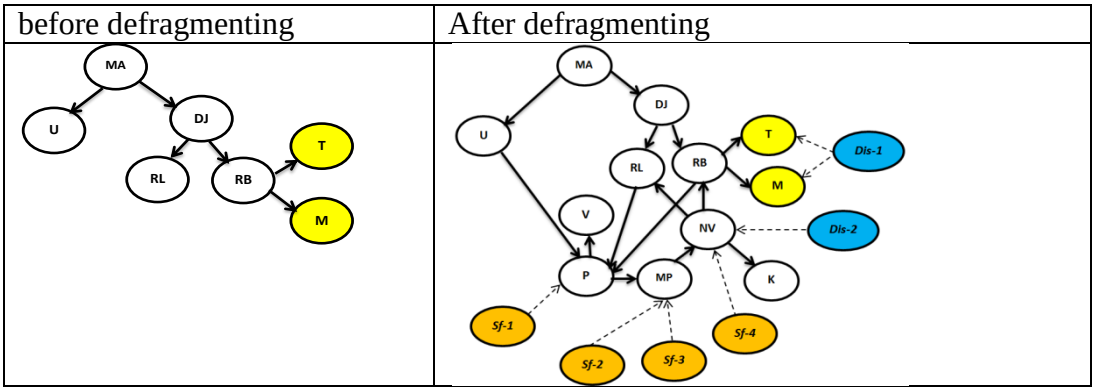
Code T and M (yellow) shows S1 misunderstood the meaning of age differences that affect the difference formula. After researchers conducted defragmenting-1 by creating disequilibrasi by asking if S1 confident with the answer or not, S1 directly to the process of reflection and bring new ideas that write 0 = 208-0,7x (indicated by arrows from RB code to KP1). After S1 perform a new strategy to make the equation 0 = 20-0,7x, researchers conducted defragmenting-2 with 1 providing cognitive conflict is to ask what happens if the human heartbeat answer is worth 0 S1 die so that it may not happen then S1 letting the answer change with a new formula with x. S1 write x = 208-0,7x (indicated by arrows code KP1 to KP2).

Because S1 is still wrong answer, the researchers did defragmenting-3 by providing cognitive conflict-2 is to ask whether the heart rate is always equal to the person's age. S1 is not always the answer, so the S1 back to change the answer by letting the new formula with y. S1 write y = 208-0,7x (indicated by arrows to the KP3 KP2 code). Researchers then defragmenting-4 by providing cognitive conflict-3 that asks if x + y = 4, what is the value of x and y. S1 answer a lot so it might as well not

answer. Here S1 deadlock think. Researchers then defragmenting-5 by providing scaffolding S1-1 is asked to associate the words "equal" with a linear equation. S1 then write 220-x = 208-0,7x (indicated by arrows U code, RL, and RB to P). Finally, researchers conducted defragmenting-6 by providing scaffolding S1-2 is asked to do a recheck of answer (40) into the old and the new formula is to meet (indicated by arrows NV code to RL and RB).

2. **Description of Process Thinking in Problem Solving Algebra S2**

The following diagram illustrates the difference or change in the structure of thought S2 before with after defragmenting process.

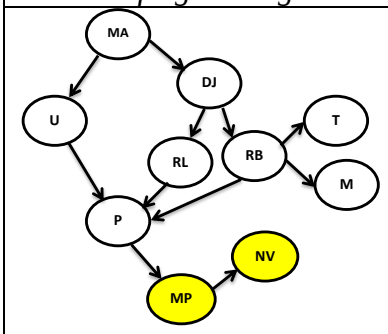
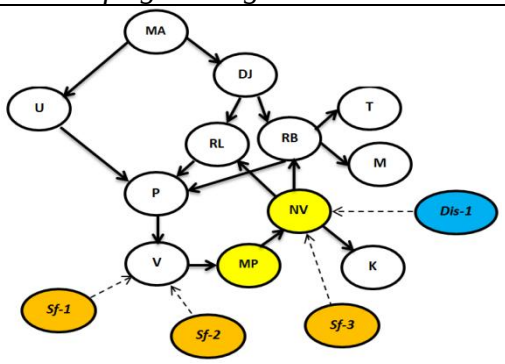


Code T and M (yellow) shows S2 misunderstood the meaning of age differences that affect the difference formula. After defragmenting researchers with creating disequilibrasi-1-1 is by asking if S2 convinced with the answer or not, S2 are not sure of the answer but not able to find a new idea though given time for reflection. Researchers then defragmenting-2 by providing scaffolding S2-1 is requesting a close watch words containing the equation and write it in the form of a linear equation. S2 then write 220-x = 208 to 0.7 with x declared of age (indicated by arrows U, RB, and RL to P). Researchers then defragmenting-3 by creating disequilibrasi-2 which asks whether S2 sure of the answer or not because S2 find age of 20 years. S2 then enter into the new and the old formula and it is not the same (indicated by arrows from the NV code to RL and RB)

Researchers then defragmenting-4 is to provide scaffolding-2 by requesting S2 attention back steps in solving linear equations. S2 then write down step-by-step linear equations with complete (indicated by the arrow from P to MP). Researchers then defragmenting-5 by providing scaffolding-3 that asks S2 perform reset operation on algebraic operations. S2 then correcting the answer and get the age of 40 years (indicated by arrows MP code to NV). Finally, researchers conducted defragmenting-6 by providing scaffolding S2-4 is asking for re-checking of the answer (40) into the old and the new formula is to meet (indicated by arrows NV code to RL and RB).

3. **Description of Process Thinking in Problem Solving Algebra S3**

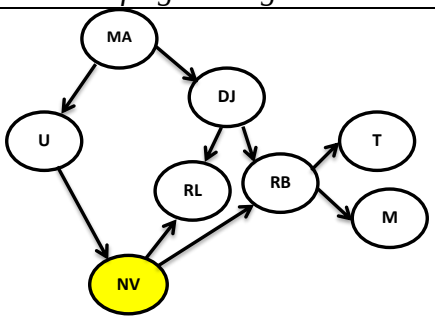
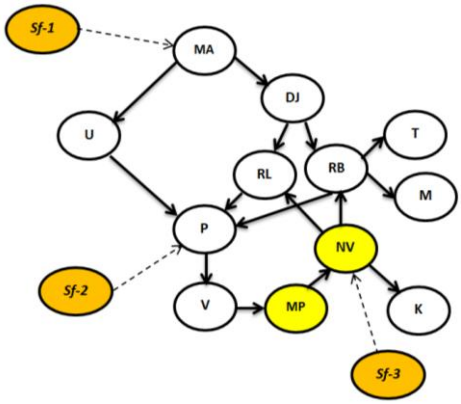
The following diagram illustrates the difference or change in the structure of S3 thinking before the after defragmenting process.

before *defragmenting*	After *defragmenting*
	

Code MP and NV showed S3 still making mistakes in solving the equation so wrong in finding that the age of 17.4 years. So the researchers conducted defragmenting-1 by creating disequilibrasi is by asking if you are sure with the answer or not. S3 seems less certain and immediate reflection. It turns out that the answer remains the same reflection results. Researchers then defragmenting-2 by providing scaffolding-1 is by asking S3 to remember the terms that are often encountered in algebra. Researchers want to remember variable S3 fishing but he still was not able to remember it. Researchers then defragmenting-3 by providing scaffolding-2 is asked to recall a term in the algebra is not yet known and will be searched. S3 is able to remember the variables so that the S3 then letting age with x and S3 was able to get the age of 40 (indicated by arrows from the V code to MP and NV). Finally, researchers conducted defragmenting-4 by providing scaffolding S3-3 is asking for re-checking of the answer (40) into the old and the new formula is to meet (indicated by arrows NV code to RL and RB).

4. Description of Process Thinking S4 in Algebra Problem Solving

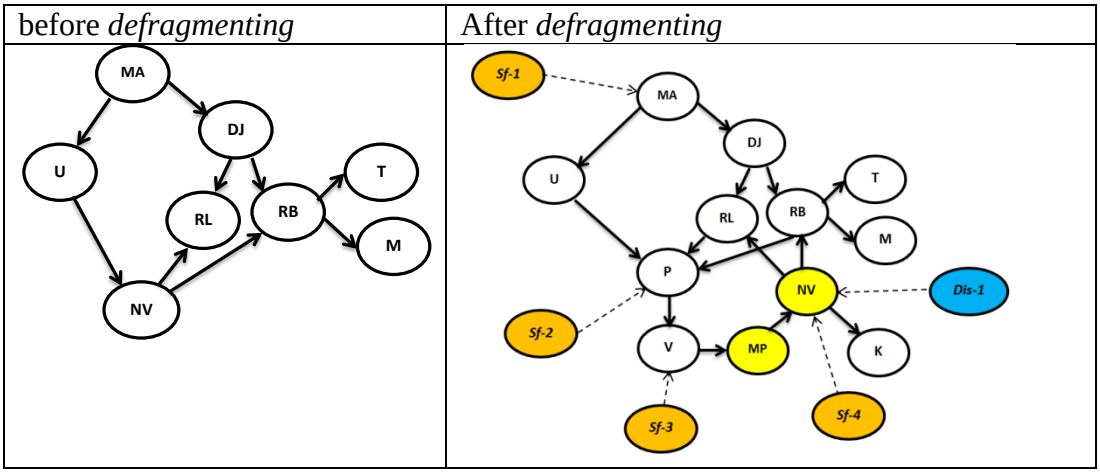
The following diagram illustrates the difference or change in the structure of S4 thinking before the after defragmenting process.

before *defragmenting*	After *defragmenting*
	

Code yellow NV shows S4 made a mistake in finding age. S4 took the middle ages from young age to old age is 30 years. Researchers then defragmenting-1 by providing scaffolding S4-1 is requested to re-read the problem carefully and again is well understood what the main problem. Researchers hope S4 associate the problem with the concept of S4 algebra but has not been able to find out where they lead. Researchers then defragmenting-2 by providing scaffolding S4-2 is requested to examine the meaning of the words containing the equation and write it in the form of a linear equation. S4 then able to translate it to write 220-x = 208-0,7x by first letting age with x. And the S4 is able to find the value of x is 40 (indicated by arrows from P to V code, MP, and NV). Finally, researchers conducted defragmenting-3 by providing scaffolding S4-3 is asking for re-checking of the answer (40) into the old and the new formula is to meet (indicated by arrows NV code to RL and RB).

5. Description S5 Thinking Processes in Solving Algebra

The following diagram illustrates the difference or change in the structure of the S5 thinking before the after defragmenting process.



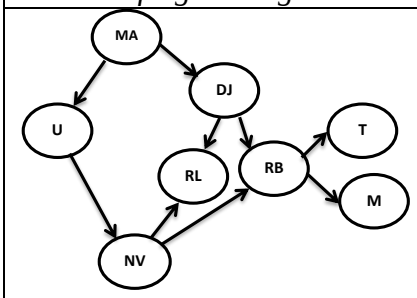
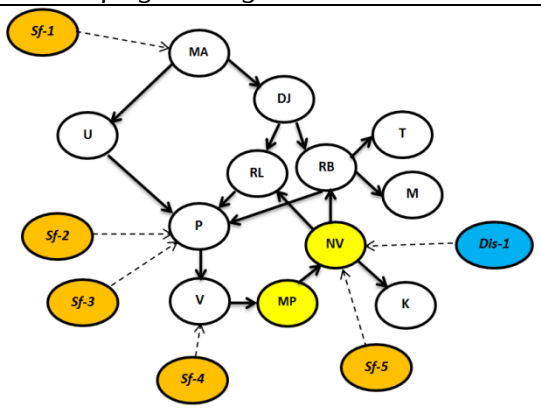
S5 has been able to guess how old he is 40 years old but with trial and error so that researchers do defragmenting-1 by creating disequilibrasi S5 is asking if you really want to answer or not, if by trial and error until how many will try, if there is no there may be other than age 40 who also meet these conditions, whether it was effective. S5 so feel free to answer and reflect but he still does not find a new strategy. Researchers then defragmenting-2 by providing scaffolding that invites S5-1 to read back issues and more accurate understanding of what the main problem would be solved. S5 then reread but still can not make algebraic problem-solving strategies.

Researchers then went on to do the defragmenting-3 that provide scaffolding by asking S5-2 to examine the meaning of the words containing the equation and write it in the form of a linear equation. S5 then write 220-age = 208 to 0.7 x age (indicated by arrows from U, RB, and RL to P). Because the S5 still write without letting the variables age, the researchers conducted defragmenting-4 by providing scaffolding-3 that invites S5 to simplify the writing and calculation process by letting age with certain letters (eg x). S5 then write 220-x = 208-0,7x and get age is 40 years (indicated by the arrow from V to MP and NV). Finally, researchers conducted defragmenting-5 by

providing scaffolding S5-4 is asking for re-checking of the answer (40) into the old and the new formula is to meet (indicated by arrows NV code to RL and RB).

6. **Description of Process Thinking S6 in Algebra Problem Solving**

The following diagram illustrates the difference or change in the structure of the S6 thinking before the after defragmenting process.

before *defragmenting*	After *defragmenting*
	

S6 has been able to guess how old he is 40 years old but with trial and error so that researchers do defragmenting-1 by creating disequilibrasi S6 is asking if you really want to answer or not, if by trial and error until how many will try, if there is no there may be other than age 40 who also meet these conditions, whether it was effective. S6 so feel free to answer and reflect but he still does not find a new strategy. Researchers then went on to do the defragmenting-2 that provide scaffolding to invite S6-1 to read back issues and more accurate understanding of what the main problem would be solved. S6 then read again the problem but he still can not resolve the algebraic way. Researchers then went on to do the defragmenting-3 that provide scaffolding by asking S5-2 to examine the meaning of the words containing the equation and write it in the form of a linear equation. S6 but still not able to understand the direction of the research question. So the researchers re-do 4 that gives defragmenting scaffolding S6-3 by asking for a re-look at the meaning of words containing the equation and write it in the form of a linear equation. S6 finally got it and then write a 220-age = 208 to 0.7 x age (indicated by arrows from U, RB, and RL to P).

Because S6 still write without letting the variables age, the researchers conducted defragmenting-5 by providing scaffolding invites S6-4 is to simplify the process of writing and calculation by letting age with certain letters (eg x). S6 then write 220-x = 208-0,7x and get age is 40 years (indicated by the arrow from V to MP and NV). Finally, researchers conducted defragmenting-6 by providing scaffolding S6-5 is requested for re-checking of the answer (40) into the old and the new formula is to meet (indicated by arrows NV code to RL and RB).

DISCUSSION

This study describes the thinking of students before defragmenting it and by defragmenting in solving algebra problems. Defragmenting made reference to some experts such as Wahono (2009), Saler and Edgington (2006), and Coggins (2007). in this section will be discussed on the thinking of students before defragmenting it and by defragmenting the algebra problem. The discussion is based on the exposure to the thinking of students who described the research results.

1. Thinking Process Subject 1 (S1) Before Defragmenting and Defragmenting in Solving Problems in Algebra

Researchers do defragmenting to restructure the thought processes S1 to become the true thought process. Defragmenting conducted by researchers include three things, namely disequilibrasi, cognitive conflict, and scaffolding. For the initial defragmenting, researchers led disequilibrasi condition is a condition where there is an imbalance in the mind of the student so that the student is expected to reflect and create the conditions for equilibrium, equilibrium conditions in mind a point indicated by the students in answering the problem. According Saler and Edgington (2006) At the time the child learns, will occur disequilibrasi. With disequilibrasi conditions, there will be a process of assimilation and accommodation, so that the scheme developed until there is equilibrium conditions. When the researchers asked about the response of S1 if you are sure or not, it appears that S1 has not convinced with the answer and finally S1 and reflection process when developing new ideas back to read more in-depth issues. When S1 describes his new idea, it appears that he began to create a new strategy. According to Polya (2004), S1 is at a stage of "device a plan". S1 has begun to understand the problems which seek to facilitate the calculation of age and age Letting S1 with x. From here the structure of algebraic thinking has begun to form. This is in accordance with that disclosed by Kaput (Hitt and Morasse in 2009) that he believes algebra as modeling. But when you get to the next phase in solving the problem by Polya (2004) that "carry out the plan", S1 again made a mistake. Errors that S1 did was he just worked with the new formula is the formula and disregard the old formula. From the error it produces, S1 difficulty in finding the value of x (age). So then came to the conclusion that the left segment used as 0 in order to meet the x value. Finally, researchers conducted a second defragmenting is to give coflict cognitive form of conflict in his mind that his hope back S1 conduct evaluation of what he did. Researchers might ask if the left side is 0, whereas the left side is the average value of the maximum heart rate, heart rate worth it possible S1 0 Finally back to re-think because it means only the dead who do not eyebrows heartbeat 0 no. S2 seemed confused to be replaced with any number that is on the left, then he replaced it with x. Researchers asked again if possible the same age with heart rate, where there is a statement that says something like that. S1 then replace it with another symbol is y. Researchers again asked if it was possible to find two variables with only one equation. S1 looks more confused, because it is likely the value of x and y so many if only one equation. Researchers Setting $x + y = 4$, what is the value of x and y. S1 then replied, can be 1 and 3, 2 and 2, 0 and 4, many possibilities. Of the questions of the researchers, there is a conflict in the mind of S1. He appears to start thinking again back with the answer. Having fished with conflicting questions earlier, S1 apparently still can not merencankan

new strategy. S1 still assume that the formula used only the new, long been abandoned. Finally, researchers conducted another defragmenting is to provide scaffolding. Researchers asked again about what is known and told S1 to write then ask again what was asked and asked S1 to relate what is known about what is being asked. According to Coggins (2007), this type of scaffolding including activing prior knowledge by first focusing on what students know and understand (knowledge mengaktfikan students by focusing on what students know and understand). After successful researchers continue checking for student understanding and how to help them advance (Coggins, 2007) by asking to read and interpret a sentence that shows no sign of equality. Having given the Scaffolding, S1 finally able to process in solving the problem of "carry out the plan" right and find an answer that prompted the age of 40 years. S1 last invites researchers to check whether the correct answer is found or not. S1 then mensubstitusikannya to both the formula and the result was the same. According to Polya (2004), S1 has been doing stage "loock back".

2. Thinking Process Subject 2 (S2) Before Defragmenting and Defragmenting in Solving Problems With Algebra

Researchers do defragmenting to restructure the thought processes S2 to become a true thought process. Defragmenting conducted by researchers include two things, namely disequilibrasi and scaffolding. For the initial defragmenting, researchers led disequilibrasi conditions. When the researchers asked about the response of S2 is already convinced or not, it appears that the S2 is not sure of the answer and finally S2 reflection process.

After a given time for reflection, it seems S2 is still confused what to do. S2 have difficulty in planning the completion strategy. Finally, researchers conducted next defragmenting is providing scaffolding. Researchers asked again about what is known and told to write S2 then ask again what was asked and asked S2 to relate what is known about what is being asked. According to Coggins (2007), this type of scaffolding including activing prior knowledge by first focusing on what students know and understand (knowledge mengaktfikan students by focusing on what students know and understand). After successful researchers continue checking for student understanding and how to help them advance (Coggins, 2007) by asking to read and interpret a sentence that shows no sign of equality. According to Polya (2004), S2 already is on pace "devise a plan".

After S2 was able to write a linear equation, then he managed to find the age of 20 years. At this stage S2 has been doing the third step in solving the problem Polya (2004) that "carry out the plan". But this answer is not the answer she wanted researcher. S2 seems less careful in performing the calculations. Errors of this kind according to Seng (2010) includes a procedural error. But it seems S2 is not aware of and confident with the calculation process. So that researchers do is create disequilibrasi defragmenting again by asking S2 to substitute in the second formula. Apparently after entered, the result is different. S2 looks confused for a moment because he felt confident with the calculation procedure. Researchers then give time to reconsider the answer. S2 seems yet to find and realize what a mistake. So the researchers re-do the defragmenting is to give back scaffolding.

Researchers conducted activating prior knowledge (Coggins, 2007) is by asking S2 write the procedure to complete in order to see clearly what it was. Having written a

complete, start to appear mistakes made by S2 is a mistake in operating the algebra 0.7x - x = 0,6x. Then the researchers continue to provide scaffolding checking for student understanding to help them advance (Coggins, 2007) by asking what is the meaning of x. S2 finally realizes that x is equal to 1x or coefficient equal to 1 S2 recalculate Finally, 0.7 to 1 = -0.3. After proceed to the next step, S2 find the requested answer is 40 years. Then the researchers re-invite S2 to check the answer is correct or not. After checking that both formulas produce the same value. In the phase-in, S2 has been doing last troubleshooting step of Polya (2004) that look back.

3. Thinking Process Subject 3 (S3) Before Defragmenting and Defragmenting in Solving Problems With Algebra

Researchers do defragmenting to restructure the thought processes S3 so that it becomes a true thought process. Defragmenting conducted by researchers only 2 things disequilibrasi and scaffolding. For the initial defragmenting, researchers led disequilibrasi conditions. When the researchers asked about the response from S3 if you are sure or not, it appears that S3 is not sure of the answer and finally S3 make the process of reflection.

After a given time for reflection. S3 then back calculate the answer. However, after re-calculated S3 apparently still find the same answer. So the researchers conducted a third defragmenting which provide scaffolding. Researchers conducted activating prior knowledge (Coggins, 2007) with the invites S3 to recall about algebra concepts. After the researchers asked about any terms that are familiar in a common algebra students, S3 then remembered with a variable term. S3 immediately thought of the letter x is often used to symbolize something that is not yet known and will be searched. S3 then letting age with x and write the equation again. At this stage, according to Polya (2004) S3 is on pace carry out the plan. S3 directly solve the equation. And it turns S3 managed to find an appropriate answer is 40.

Although only a few scaffolding is given, it can improve the error immediately S3 and able to answer with the right answer. From here terihat that when the equation has been modified to use a variable, S3 is easier to operate so successfully obtain the requested answer. Then the researchers re-invite S3 to check the answer is correct or not. Having checked that both formulas produce the same value. In the phase-in, the S3 has done last troubleshooting step of Polya (2004) that look back.

4. Thinking Processes Subject 4 (S4) Before Defragmenting and Defragmenting in Solving Problems With Algebra

In the face of problems aljbar given, the S4 is able to explain all the available information from the old and new formulas in calculating the average of the maximum heart rate, the increase and decrease in the average value of the maximum heart on a new formula of the old formula for young and old old. S4 also understand the problem in question is to look for age such that the average value of the maximum heart rate formula is not new with the old formula is no difference. In this case S4 is at a stage of understanding the problem (Polya, 2004). The next stage, the S4 did devise a plan that set a plan or strategy to solve the algebra problem. Plan which will be S4 is taking middle age. S4 think that if the average age of a person is 60 years old, the middle aged person's

estimated 30 Next S4 did carry out the plan of carrying out a plan to enter the value 30 into the new formula and the old formula and the result was not the same. But unfortunately S4 does not continue the process of thinking. S4 just stop there. From the answers S4, we can see that he had congestion in thinking. S4 itself is also very not sure of the answer because he has not found it so disequlibrasi conditions already created. So the researchers directly leads to the next defragmenting the scaffolding. At first scaffolding, researchers asked S4 to reread the problem. After the researchers asked S4 write in detail what it is known that both the information and the formula is in question plus what is asked in the question. At this stage the researchers conducted activating prior knowledge (Coggins, 2007). Furthermore, researchers asked S4 to read and interpret a sentence that shows sign of equality. At this stage the researchers conducted checking for student understanding and how to help them advance (Coggins, 2007). When researchers asked to connect between the two formulas with words there is no difference, S4 immediately thought of the equation. It turns out that S4 was able to grasp what the researcher wants. S4 directly compiled devise a new plan to create a linear equation of existing information. At this stage, algebraic mindset has begun to emerge. In fact, he immediately letting age with "x" to simplify the calculation. From this it can be seen that the S4 has been able to make mathematical modeling. It is conformed to that disclosed Kaput (in Hit and Morasse, 2009) which says algebra as modeling.

After understanding the problem and planning a new strategy with algebraic methods, S4 immediately perform the next phase in problem solving Polya (2004) that carrry out the plan. At this stage of the plan, it appears that the ability of S4 in algebraic form very good operate. The end result S4 find the age of 40 as the age suitable to address the heart rate. In the last step the researchers did not forget to invite S4 to do a check of the answers obtained. S4 immediately substituted into the two formulas that exist both old and new. Having found that the second formula does not produce a different niali then truly appreciate the S4 feel confident. At this stage, the final stage of the S4 did solving process Polya (2004) that look back or look back. Now think S4 structure is complete.

5. Thinking Processes Subject 5 (S5) Before Defragmenting and Defragmenting in Solving Problems With Algebra

Researchers do defragmenting to restructure the thought processes S5 so that it becomes a true thought process. Defragmenting conducted by researchers only 2 things disequilibrasi and scaffolding. For the initial defragmenting, researchers led disequilibrasi conditions. When the researchers asked about the response of the S5 is already convinced or not, he is convinced that the answer is 40 But when the researchers provoke the question of whether it was the only answer, S5 replied that there may be another answer. His mind had started having suspicions will answer. Researchers give time for the S5 to rethink how to answer because and stimulate new

ideas to bring that can be solved with a more effective way is to use algebra mindset. However, even given the time to re-think the methods used, the S5 is still not able to bring new ideas. Aritmatiknya mindset is still dominant compared with algebraic mindset. So the researchers conducted a third defragmenting which provide scaffolding. Scaffolding initial research is activating prior knowledge (Coggins, 2007) is by asking back what is known and told S5 to write then ask again what was asked and asked S5 to associate with what is known about what is being asked. After successful researchers continue checking for student understanding and how to help them advance (Coggins, 2007) by asking to read and interpret a sentence that shows no sign of equality. According to Polya (2004), S5 has been in step "devise a plan". Having given the scaffolding, S5 finally able to process in solving the problem of "carry out the plan" right through algebraic methods and find answers that are asked are age 40 years. S5 last invites researchers to check whether the correct answer is found or not. S5 then mensubstitusikannya to both the formula and the result was the same. According to Polya (2004), S5 has been doing stage "loock back".

6. Process Thinking Subject 6 (S6) Before Defragmenting and Defragmenting in Solving Problems With Algebra

Researchers do defragmenting to restructure the thought processes S6 to become a true thought process. Defragmenting conducted by researchers only 2 things disequilibrasi and scaffolding. For the initial defragmenting, researchers led disequilibrasi conditions. When the researchers asked about the response of S6 if you are sure or not, he is convinced that the answer is 40 But when the researchers provoke the question of whether it's just the only answer, S6 replied that there may be another answer. His mind had started having suspicions will answer. S6 presuppose that young age 17 and age 57, the older middle age 37. Apparently after admission, is not the same. Afterwards S6 are confused.

Researchers expect the S6 to bring mindset algebra, but it still does not work. Finally, researchers conducted a third defragmenting which provide scaffolding. First researchers conducted activating prior knowledge (Coggins, 2007), ie by activating the student's knowledge by focusing what students know. Researchers asked students to read back issues and asked to write down the information that is either known or asked. After that do the checking for student understanding and how to help them advance (Coggins, 2007) which check students' understanding and how to help advance the development of students. In this case the researchers asked S6 to read and interpret a sentence that shows sign of equality. Researchers continue to direct the S6 to make the equation of both the existing formula. But it seems S6 still can not capture the desire of researchers. So that researchers repeatedly asked S6 to link between the new formula and the old formula and what is asked.

S6 eventually begin to understand what the purpose of research. S6 directly perform devise a plan (Polya, 2004) is to create a new linear equations. Proceed to carry

out the plan (Polya, 2004) is to solve linear equations by first letting age with "x". So that S6 can find the requested age, without having to dabble, but the calculation. And once again invites researchers to reflection by asking S6 to double check. In this case the activity of S6've done look back (Polya, 2004). And it turns out after actually getting the same results, S6 then feel very confident with the answer. Defargmenting can improve S6 mindset to be able to think of algebra.

Defragmenting conducted by researchers are able to make the student improve his mistakes and fix them so that finding the right answer. According Wahono (2009) after defragmentation, all data ter-defrag will be interconnected and organized so it is easy to take and explain any data to be retrieved.

CONCLUSION

From the results, it can be concluded that the mistakes made by students in solving algebra problems include: 1) one in understanding the existing problems which resulted in the inability of the students in developing algebraic equations; 2) one of the kekurangtelitian caused operate algebra students in solving equations; 3) wrong in developing problem-solving strategies that students are still working on algebra problems with arithmetic means, not a variable set of linear equations but experimenting for some specific numbers are still weak due to the concept of algebra students in solving mathematical problems; and 4) does not presuppose a variable with a particular symbol or letter that the difficulty in solving linear equations.

Defragmenting conducted by researchers is to create disequlibrasi by asking students if already sure of the answer or not, cognitive conflict by giving students about completing 1 linear equations with two variables if students can find a solution, and scaffolding by asking students to interpret the word equation and transforming into mathematical sentence is compiling a linear equation and ask the students to check the age of the already obtained substituting into the old and new formulas.

ADVICE

From these results, the researchers present some suggestions as follows.

1. Researchers, teachers, and observers of the learning process need to understand the thinking of students in solving problems, so as to provide treatment (defragmenting through cognitive mapping) required students to improve their ability to solve problems.

2. The study in this research is still limited, namely to solve algebra problems. because it is still open opportunities further research is primarily concerned with: making learning

design, modules, instructional media, or instructional materials that can improve students' errors in solving the problem.

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