Analysis of the Mathematical Problem Solving Components of Hyperactive Students inLinear Equation System

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Abstract. This study aims to describe the mathematical problem solving components that will emerge when hyperactive students do problem solving for the Two-Variable Linear Equation System (TVLES). This research was conducted in class VIII of SMP Negeri 2 Sruweng.This type of research is qualitative research. The technique in taking the subject uses purposive technique with as many as two selected subjects. The instrument the researcher used was in the form of a test. Data collection techniques used were tests, interviews, documentation and think aloud.The results of this study indicate that the components of mathematical problem solving that appear in hyperactive students when solving TVLES material problems are as follows: 1. Concepts; 2. Processing; 3. Skills; 4. Attitude. First, students change the information obtained so that formed understanding through non-verbal representation (written) in the form of TVLE and TVLES concepts. Second, students when processing do a series of cognitions in building interrelations between concepts to help solve problems. Third, students perform calculation skills (computing) to manage concepts in solving problems. Fourth, students have a nonchalant attitude. In general, hyperactive students do not solve problems by elimination and substitution but by trial and error.

Keywords: hyperactivity, problem-solving, TVLES

1 Introduction

Problem-solving in mathematics learning is an essential part because solving problems is an important part of mathematicslearning. Problem-solving is an activity of understanding and solves the problem in mathematics as well as in daily life.Solving problems students are required to understand the problem and the information presented in the problem, to properly conceptualize the problem in his/her mind based on the information given within the problem, to design and follow a plan and to make the calculations required [1].Problem solvinghas many functions moreover in mathematics learning. Problem solving has an important role in mathematics education [2]. Problem-solving is important in a lesson to do a problem-solving activity and develop the students' capability related to mathematics.Important reasons are given in supporting problem solving because they are able to develop cognitive skills, foster creativity, part of the mathematical application process, and motivate students to learn mathematics [3]. Problem solving has benefits in learning mathematics, it is also used in solving daily problems. The main purpose of mathematics teaching is to enable students to

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solve daily life problems [4]. So, problem solving is very useful both in learning mathematics and in daily life.

Mathematical problem solving plays an important role in determining solutions in the main problems of the discussion of mathematics in the process of learning mathematics.Problem solving is one of the major curriculum curriculum which is required for students to apply and tointegrate many mathematical concepts and skills as well as making decisions [5].The process of learning mathematics without solving mathematical problems will result in a gap of understanding in the learning process, because solving a problem requires solving problems from everything learned in the process of learning mathematics. Mathematical problem solving every student has different understanding abilities. Previous studies conducted by several researchers have explained this.First, mathematical problem solving for normal students based on gender has a different understanding [6]. Second, the ability to solve mathematical problems in normal students based on Adversity Quotient (AQ) has an understanding of each [7]. Third, normal students' problem solving abilities vary based on their cognitive style [8]. Fourth, the results of research conducted are not much different from the results of research [6], [7], and [8], that mathematical problem solving in normal students has an understanding that varies based on the level of ability high, medium, and low [9].

Mathematical problem solving students can be seen from its components. Components of mathematical problem solving include concepts, processing, metacognitive, skills, and attitudes [10]. These components are categorized for normal types of students, because even normal students have different abilities especially hyperactive students. Researchers often conduct research related to mathematical problem solving in normal students, but have not revealed the components of hyperactive student problem solving. Previous studies related to hyperactive students whose results describe hyperactive students and efforts to overcome them in third grade students of Primary School [11]. Hyperactive students one kind of students in public schools that are included in the category of abnormal students (mental disorders). Not all students in public schools are normal, but there are also abnormal (mental disorders). Abnormal students (mental disorders) include autism, anxiety, dyslexia, Asperger, depression, superactivity and hyperactivity [12]. Abnormal students (mental disorders) actually need special attention, as do hyperactive students.Hyperactive students are students who experience disturbances in concentration and are accompanied by hyperkinetic (too much motion). Other names for hyperactivity are Attention Deficit Disorder (ADD) or Attention Deficit Hyperactivity Disorder (ADHD). Attention Deficit Hyperactivity Disorder (ADHD) precisely describes the barriers to hyperactive students in concentrating concentration. Most students who experience disturbances in concentration are accompanied by hyperkinetic (lots of movement). The hyperactive student has his way of thinking [12]. There is a difference in the problem-solving component between hyperactive students and normal students in the mathematics learning process. One of the materials learned in the process of learning mathematics is the Two-Variable Linear Equation System (TVLES).

Based on this the researcher is interested in conducting research related to the mathematical problem-solving component of hyperactive students in the material of the Two-Variable Linear Equation System (TVLES) because this research is still rarely done. The purpose of this study is to find out and describe the mathematical problem-solving components that arise when hyperactive students do TVLES material problem-solving.

2 Method

This study used qualitative research with a phenomenological approach. This research was conducted at SMP Sruweng 2. The researcher used a purposive technique as a subject taking technique because the subjects were taken based on certain considerations and not randomly. This consideration is based on the characteristics used as an indirect questionnaire indicator. Subjects who meet these considerations are hyperactive students. The hyperactive student was obtained from the results of interviews with the guidance counseling teacher and indirect questionnaire. Two hyperactive students became identical subjects. The instruments used were problem solving tests, and unstructured interviews. The problem solving test instrument consists of one question:

> "There is a child who lives with his father, the child is named Arto. Arto's age four years ago was $\frac{1}{10}$ the age of his father in the next twenty years. Now Arto is five years older than $\frac{1}{6}$ of his golden age six years ago. How old is Arto now?".

Data collection techniques using tests, interviews, documentation and think aloud. Data analysis techniques with steps of data reduction, data presentation, and drawing conclusions.

3 Results

Presentation of subject data representing two identical subjects in conducting problem-solving tests as follows. The first stage of the subject in solving problems related to TVLES test questions is reading the questions. The subject did the first step, which was to read the questions while understanding the problem. The subject after understanding the problem then writes down what information is known and asked for the problem-solving test.

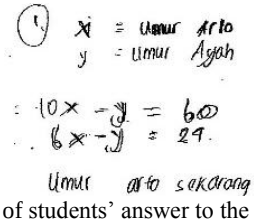

Fig. 1. Results of students' answer to the concept components

Based on the results of the work above, it appears that the subject writes the concept of two-variable linear equations (TVLES) which is when the subject writes one equation $10x - y = 60$or$6x - y = 24$. The concept of a two-variable linear equation system (TVLES) is when the subject has written both equations. Subjects can understand the questions given even if they do not meet the language listed in the questions but can write information that is known instantly and what is asked based on information obtained from problem-solving test questions.

The following are excerpts from researchers' (P) interviews with the subject (S).

P : "Earlier you already gave me a question, you already did it?"

S : "Yes".

P : "What material is related to the two problems that you have been working on just now?"
S : "TVLES, TVLES".
P : "Where did you write this equation from?"
S : "Than is known".
P : "Where is it known?"
S : "".Known problem
P : "What was asked about question number 1?"
S : "Arto age".

Based on the interview passage, the subject is able to briefly explain the information obtained from the questions. For example when asked about what material, the subject knows the actual TVLES material, besides that it can mention that the equations made are from what is known in the matter. The subject understands what he will look for from that problem, namely Arto's age.

The next problem solving stage is to make a plan for solving the problem. The subject performs the problem-solving planning step by making a mathematical model of the information in the problem. The subject makes an instant equation from the information in the problem. The subject suppose that Arto's age is x and his father's age is y and is applied in making the equation.

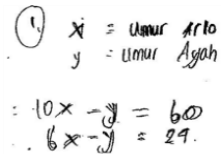

Fig. 2. Results of subjects in processing components

Based on Fig. 2, the subject writes a mathematical model of what is known from the problem. This is included in the processing component, which is processing information from problem-solving sentences into mathematical models, albeit instantly. After the subject makes a problem-solving plan with the mathematical model.

Think aloud of the subject that appears at 51 seconds while working on the test:"xArto age y fatherage, then$10x - y = 60$I crossed it$6x - y = 24$then the age of Arto now? "Based on the think-aloud above shows S1 doing while expressing his thoughts, it appears that the processing component appears. Processing in which the subject makes a mathematical model of what information is on the problem-solving test even though instantaneously.

The next step is to carry out a problem-solving plan in which the subject guesses the numbers that if substituted into the equation produce correct results in accordance with the equation that has been made. This is a trial and error solving strategy. The same numbers are then taken as values from previously assumed variables.

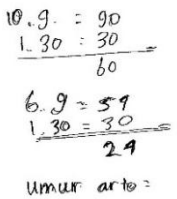

Fig. 3. Results of subjects for processing components and skills

Based on Fig. 3, the subject determines the values of x and y by guessing the numbers entered into the equation. This shows the processing and skill components. The processing component is step by step from trying to guess numbers, substituting and calculating the results. Counting is a component of numeracy (computing) skills. Counting skills (computing) from S1 include multiplication and subtraction. The multiplications performed by the subject are as follows$10 \times 9 = 90$; $1 \times 30 = 30$; $6 \times 9 = 54$; $1 \times 30 = 30$,then subtraction$90 - 30 = 60$; $54 - 30 = 24$.

The following are excerpts from researchers' interviews with the subject.

P : "Why do you determine multiplication 10×9and1×30?"

S1 : "Let this be what 60, let the results 60".

The results of the interviews related to lift rates substituted into the equation. These numbers are choices that will show the correct results based on the equation.

Think aloud the subject when 01 minutes 41 seconds while working on the test: "$10 \times 9 = 90$ then$1 \times 30 = 30, 90 - 30 = 6$yes 60 then$6 \times 9$, 6×9how many, 6×9how many sis? Yes, counted, let's count, there are doodles, let's count! okay (count with his fingers) 4, 5, 54. $1 \times 30 = 30$. 2 what, yes, yes 4, 5 reduce 2, 24 ($54 - 30 = 24$). So Arto's age is9".

Based on the subject's thinking aloud it is clearly seen that the processing component and skills emerge. Subjects do the processing step by step until they know the results sought from the problem solving problem. The subject in processing is also offset by doing computational skills (computation), namely multiplication and subtraction.

The final stage in solving problems is to double-check the results of his work. Judging from the workmanship documentation that the subject does not re-check the work. Researchers give attention by asking the subjects to double-check the results of their work, but the subject still did not want to check again. Then the researchers concluded that the component of metacognition did not appear on the subject.

The attitude that appears on the subject is an attitude of indifference towards what he dislikes. For example when a subject is invited to speak not all are digested immediately. The attitude of the subject at will, only do things that he feels comfortable.

Based on the data presented above, the subject did three stages of mathematical problem solving on TVLES material including understanding the problem, making a problem-solving plan, and implementing the problem-solving plan. The last stage is to re-examine the solution to the problem, but the subject does not do this. Subjects in solving mathematical problems appear several components including concepts, processing, skills, and attitudes. The subject did not perform the stage of checking back on the problem solving that had been done then the metacognition component did not appear on the subject.

4 Discussion

The mathematical problem-solving component that appears at the stage of understanding the problem is the concept Researchers discuss the results of research on the mathematical problem-solving component of hyperactive students on TVLES material. The mathematical problem-solving stage by the subject is Polya's problem-solving stage. In this study each of Polya's stages in solving TVLES problems, the subject raises several components of mathematical problem-solving.

The mathematical problem solving component that appears at the stage of understanding the problem is the concept, where students at this stage are able to understand the problem in the problem. The subject is required to know what information and problems will be sought in the matter. Students when alternative problems where students are encouraged to seriously consider practical constraints and assumptions into concepts then calculations[13].Understanding mathematical concepts can form a network of connections between mathematical concepts with representational [14].

The component of mathematical problem solving that appears at the planning stage of a problem is processing. The subject is able to apply the concepts in representation that is making mathematical models based on test questions. The subject of making a mathematical model is included in the processing activity because making a mathematical model is one of a series of problem solving. Processing always appears when the subject is solving the problem. The process used to solve problems is part of solving problems with student strategies [15]. There are many problem solving strategies that are often used in the problem solving process [16].

Components of mathematical problem solving that arise at the stage of problem-solving (implementing strategies) are skills. The subjects in this stage perform the skills to find solutions to problems from mathematical models. Solving a problem from a known mathematical model that is looking for the value of variables from the mathematical model. At this stage, the subject makes a guessing strategy and checks to find the value of the variable x or y, i.e. by guessing the numbers that were substituted into the mathematical model will produce the correct results. Subjects in solving these problems appear skills, namely in the processing of looking for variables x or y, the subject performs numeracy skills (computing). Counting skills (computing) that appear on the subject are multiplication, subtraction, and addition. Based on the description that problem solving is necessary to have arithmetic skills in implementing problem-solving strategies. In carrying out a plan or implementing a problem-solving strategy it is necessary to carry out calculations [17]. The calculation, in this case, is a form of arithmetic skills. Problem-Solving process is explained as a complex process that requires many skills to be used together [18]. Skills are skills or the potential to master expertise both innate and the results of training and are used to do something that is realized through action [9].

The mathematical problem solving component is then in the stage of checking answers again. The subject did not check again after finishing solving the problem. The subject did not try as optimal as possible in solving the problem, so the metacognition component did not appear at this stage. Re-checking stage which is often not raised by the subject, so the subject is unable to fulfill the skills of cognition. If the subject does not perform any of the skills of cognition then metacognition does not appear. Metacognitive knowledge in problem solving focuses on an individual’s control of their cognition [19]. Three cognitive skills plan, monitor and evaluate (re-examine the thought process) [20].

The last component of mathematical problem solving is attitude. The attitude that appears on the subject is an attitude of indifference to what it encounters. The subject when spoken to is not all digested immediately. The attitude of the subject at will, only do things that he feels comfortable.Attitudes in learning mathematics have a close relationship with students' perceptions of mathematics. A positive attitude towards mathematics reflects positive emotions and vice versa. Attitude interferes with one's willingness to learn and also the benefits derived from learning mathematics[21].Fun experiences gained from learning will facilitate the improvement of students' positive attitudes towards mathematics. Besides attitude also has a close relationship with the kinds of students (normal students and hyperactive

students) that affect problem-solving.Several studies and studies have been conducted in many countries to find factors that influence students' problem solving in mathematics. Among these factors, students' attitude towards mathematics is one of the important factors[22].

5 Conclusion

Based on the results of research and discussion of hyperactive students when solving problems through the Polya stages do not do the stages of checking back so it does not meet the cognitive skills. Cognition skills are not fulfilled so metacognition does not appear. Based on this it can be concluded that the mathematical problem-solving component that appears in hyperactive students when doing problem-solving on the material (SPLDV) is as follows:

a. Concept
   Students change the information obtained so that formed understanding through non-verbal representations (written) in the form of TVLE and TVLES concepts.
b. Processing
   Students, when processing does a series of cognitive activities in building interrelationships between concepts to help solve problems.
c. Skills
   Students perform arithmetic skills (computing) to manage concepts in solving problems.
d. Attitude
   Students have a nonchalant attitude when solving problems.

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