Prospective Teachers’ Structure Patterns of Awareness and Regulated Thinking During Solving Problems In Algebra

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Abstract— The purpose of this study is to describe the structural pattern of awareness and regulated thinking a prospective teacher in solving problems algebra. Component awareness and regulated thinking in this study refers to attention, recall information, planning, monitoring and evaluation. This study uses a qualitative method with four subject research. The results showed that the pattern structure of awareness and regulated thinking a prospective teachers complete and incomplete. Moving is not linear, but cyclical, dynamic and repetitive.

Keywords: Prospective Teacher, Awareness and Regulated Thinking, Solving Problem, Algebra

I. INTRODUCTION


Attention is centering mental power to things external and internal (Solso, 2008). Attention implies a waiver of any other object that someone is able to effectively deal with the specific object (James, 1890). Attention is likened to a spotlight that focuses light beam in the direction of interest. For example, when we are on the shore, we point the spotlight on the ship that looks distant. Attention can also be transferred into the mind and memory. For example, we are able to bring the conscious mind and the memories of the past which is a feature that cooperated with the recall process knowledge / information. In terms of solving problems, attention is centering on a problem that will be solved marked with reading problems, understand the intent and purpose of the issue. Recall information / knowledge is the process of making information on the individual concerned and the world around (Solso, 2008). Awareness enables people to gain access to knowledge through the process of recall (and recognition) the information about the self and the world. The process is carried out mainly with the help of processes attentional conducted internally and externally.

Schraw (1994) suggested that regulated thinking refers to the planning, monitoring and evaluation. Planning is the selection of the right strategy and the allocation of resources that impact performance. Examples make predictions before reading, stringing strategies and allocate time or selectively pay attention before starting the task. Monitoring is an online awareness of completeness and performance of one’s duties. The ability to test themselves or ask themselves when learning is a good example on monitoring. Evaluation is to assess the results and the process of regulated one’s learning. For example, to re-evaluate one’s objectives and conclusions. So regulated a prospective teacher thinking in
solving algebra problems, namely, prospective teachers stringing strategy, allocate the appropriate time, to monitor and assess the performance of the completeness of the results and the process of thinking.

The purpose of this study is to describe the structure of an algebraic problem solving. Describing the structure of awareness and thought regulated a prospective teacher. So found a pattern structure awareness and thinking regulateds prospective teachers in solving algebra problems.

II. RESEARCH METHOD

The method used is qualitative research. The goal is to describe the structure of awareness and thought regulated each prospective teachers in solving algebra problems. Subjects in this study amounted to 4 students study math education programs that have take a course in elementary algebra and is already implementing the practice field experience. Instrument research that task sheet, performance and results of think aloud. Sheets task in this study as follows,

1. determine all values of a so that the linear system,
   \[\begin{align*}
   x_1 + x_2 - x_3 &= 2 \\
   x_1 + 2x_2 + x_3 &= 3 \\
   x_1 + x_2 + (a^2 - 5)x_3 &= a
   \end{align*}\]
   a. have infinite many solutions  
   b. not have solution 
   c. having a unique solution
2. draw a graph of question in number 1! 
3. what can you conclude from the graph in question in number 2?

III. RESEARCH RESULT

A. The results of research on the subject 1 (S1)

The results showed that S1 has been able to apply elementary row operations on a matrix correctly. S1 perform elementary row operations to write the linear equation system in the form of a matrix and then S1 determine the main lines operate with each other. Elementary row operations performed until the matrix shaped ecelon line. After ecelon shaped line, S1 determine the value of a. S1 also been able to determine the terms linear equation system has infinitely many solutions, do not have a solution and have a unique solution. S1 has been able to draw the graph of linear equation system with infinitely many solutions, do not have a solution and a singular solution to illustrate each equation in the linear equation system and determine the cutoff point of each equation on the axis x1, x2 and x3 as in figure 1.1, 1.2 and 1.3. S1 has been able to make conclusions linear equation system has infinitely many solutions, do not have a solution and have a solution based on the graph.

Figure 1.1: graph of infinite many solutions

Figure 1.2: graph of do not have a solution

Figure 1.3: graph of unique solution

Structure of problem solving and the structure awareness and regulated thinking S1 including the complete category. Structure of problems solving and the structure awareness and regulated thinking prospective teachers are presented in Figure 1.4 and Figure 1.5 below.
From Figure 1.4 can be explained that the steps in problem solving structural move is not linear but cyclical and repetitive structure as well as the stages of awareness and thought regulated prospective teachers move is not linear but cyclical and repetitive. Completeness of the structure awareness and thought regulated S1 can be observed from the full awareness component and regulated S1 think that attention, recall information, planning, monitoring and evaluation. S1 attention when doing activities with the code a, e, i, k, l and m. Recall information on current events with a code and e. Planning once the action with the code b, d, e, i, j and l. Monitoring during activities with code c, e, k, l, m, n and o. Evaluation at the time c, d, f, g, h, k, m, n and o. as in figure 1.6.
B. The results of research on the subject 2 (S2)

S2 has been able to operate the matrix, determining the terms of linear equation system has infinitely many solutions, do not have a solution and have a unique solution. However S2 only draw the graph of each equation in the SPL. S2 has not been able to draw a graph of the linear equation system that has infinitely many solutions, do not have a solution and have a unique solution as the image around 2.1, 2.2 and 2.3. Consequently S2 can not make conclusions form graph has infinitely many solutions, do not have a solution and have a unique solution.

S2 problem solving structure is incomplete as presented in Figure 2.3. S2 can not make conclusions based on the graph that is coded with n, o and p. The structure awareness and thought S2 regulated complete as presented in Figure 2.5. completeness of the structure shown by the emergence of awareness components and regulated thinks that attention, recall information, planning, monitoring and evaluation. Structure of problem solving and the structure awareness and thought regulated S2 move is not linear but cyclical, dynamic and repetitive.

The structure awareness and regulated S2 in solving algebra problems considered incomplete because the structure is not complete solving problem. S2 did attention during activities with the code a, d, g, h, i, j, l and m. recall information on the current activities of the code c, h, i and l. Planning once the action b, e, i, j, k and l. Monitoring during activities with code f, i, l and m, evaluation once the action with the code m.
C. The results of research on the subject 3 (S3)

S3 was able to write the linear equation system in the form of a matrix, operate an elementary row on the matrix, determining the terms of linear equation system has infinitely many solutions, do not have a solution and have a unique solution. S3 but less careful in determining the value of a so that the linear equation system has infinitely many solutions. S3 has been able to determine the value of a so that the linear equation system does not have a solution. But not specify a value so that the linear equation system has a unique solution.

In drawing graphs SPL, S3 still fixated with the x, y and z, whereas the linear equation system using variables x1, x2 and x3. At the time of drawing graphs with infinitely many solutions, S3 is still not accurate in determining the coordinate point that should be the point lies in the positive x-axis is placed on the x-axis negative as in figure 3.1. Furthermore, since the value of a in the linear equation system which has infinitely many solutions are not right then the graph is also not right. S3 in the linear equation system graph drawing does not have a solution is still not right though the coordinates of the point of intersection of each equation is correct as in Figure 3.2. For a graphic image of the linear equation system with a unique solution, no menggambarakan S3 graphics but simply stated that the linear equation system has a unique solution.

Gambar 3.1: graph of infinite many solution
Gambar 3.2: graph of no solution

S3 in making inferences based on the chart, many states have an infinite number of solutions for the graph coincide. While the picture is not visible graph coincide. Furthermore S3 concluded not have a solution for parallel graph. Yet the picture is not visible graphic image alignment. Next S3 states have a unique solution because it has a cut-off point, but does not draw the graph S3 linear equation system with a unique solution.

Figure 3.3: Structure of solving proble algebra S3
Figure 3.4: Structure awareness and thought S3 in solving problem algebra
Figure 3.5: Structure of awareness and regulated thinking S3 in solving problem algebra

The structure of problem solving S3 including the complete category because all the code on the structure of problem solving activities have emerged as in Figure 3.3. The structure of the settlement issue in moving S3 is not linear but cyclical, dynamic and repetitive. The structure awareness and thought S3 regulated complete because all the components awareness and thinking regulateds appear. Structure
awareness and regulated S3 thinking in solving problems due struktur categorized as complete problem solving and the structure of awareness and thought the regulated was complete as in figure 3.5. S3 do attention when conducting activities with the code a, f, g, h, l, m, n, o and p. Recall information when conducting activities with code f, g, h, m, n, o and p. Conduct planning at the time of activity b, c, d, i and k. Monitoring during activity i and j. Perform evaluation at the time of the code i degan activities.

D. The results of research on the subject 4 (S4)

S4 algebra problem solving begins by writing the linear equation system in the form of the augmented matrix. Then megoperasikan Gaussian elimination on the matrix. S4 less scrupulous when subtracting the second row with the third row is 1 - (-1) = -2 as in figure 4.1. S4 also less careful when determining the value of a so that the linear equation system has infinitely many solutions as in Figure 4.2.

In describing the linear equation system graph has infinitely many solutions. S4 is not appropriate due to lack carefully situations in determining the value of a at the time of linear equation system has infinitely many solutions as in figure 4.3. S4 less appropriate to write down the coordinates of (2, 3/4). In determining the linear equation system does not have a solution S4 menyubstitusikan not a value that is already known in the SPL, but the S4 menyubstitusikan a value in the third equation of the linear equation system and coordinate points obtained does not refer to the equation as in Figure 4.4. As a result, the image grafiknya not exactly as in figure 4.5. S4 can not draw a graph of the linear equation system with a unique solution and could not make conclusions based on the graph.

Structure is not complete problem resolution S4 shown with the advent of the activities with the code m, n, o and p as in figure 4.6. The structure awareness and thought S4 regulated including the complete category indicated by the emergence of all the components awareness and thinking regulated as in figure 4.7. The structure awareness and thought regulated S4 included in the category is not complete because the component of the structure of problem resolution is incomplete as in figure 4.8. S4 activity attention during activities with a code, g, h and j. Recall information during activity b, c, d, g and j. Conduct planning once the action with the code b, c, d, e, f, i, j and l. Monitoring at the time b, c, d, i and k. To evaluate the current activities of the code i, j and l.
The structure of consciousness and thought regulated a prospective teacher has a certain pattern. The first structure of consciousness and thinking regulated prospective teachers in solving problems categorized as complete. Structure awareness and regulated thinking in solving algebra problems incomplete if the components of the solution to the problem complete that component with activities code a, b, c, d, e, f, g, h, i, j, k, l, m, n and o. Components of awareness and regulation of thinking that attention is also complete recall information, planning, monitoring and evaluation. The second structure awareness and regulated thinking to solve problems not considered complete. Structure awareness and regulated thinking in solving problems is incomplete if the structure of the settlement of the problem, the structure of consciousness and thinking regulated incomplete. The structure of consciousness and thought regulated prospective teachers move is not linear but cyclical, dynamic and repetitive. Moving is not linear means not moving from the top down. Cyclical means moving from a component to another and back again same component. Dynamic means to move up, down, and sideways. Repeats means repeat of a component and back again same component.

In operating the elementary row prospective teachers have no problems, only S3 and S4 are less conscientious. In determining the terms of a linear equation system has infinite solutions, do not have a solution and have a unique solution Prospective teachers are also not experiencing difficulties. For a graphic image of a teacher linear equation system prospective still experiencing difficulties. S1 has been able to draw the graph properly, S2 draw graphics still fixated on each equation. S3 draw a graph with the steps that are appropriate but in determining the coordinates of the point of intersection is still not right. S4 in drawing the graph is still not right. In making conclusions based on the chart, 2 prospective teachers have been able to conclude that the graph which coincides have infinitely many solutions, which do not intersect the graph does not have a solution and a chart that has a cut-off point has a solution. 2 prospective teachers can not make conclusions based on the graph because the graph is still fixated on the image of each equation is not in the SPL. This is in accordance with the opinion of Kilpatrick (1985) that a person who has a conceptual and procedural skills are not always able to solve the problem.

V. CONCLUSION

The results of the study according to the study of theory that awareness structural components and arrangements of prospective teachers thinking in solving algebra problems referring to attention, recall information, planning, monitoring and evaluation. The structure awareness and thought regulated prospective teachers move is not linear, but cyclical, dynamic and repetitive. The structure awareness and thought regulated S1dan S3 in solving algebra problems including the complete category. While solving algebraic structure S2 and S4 included in the category is not complete.

Component structure awareness and regulation think prospective teachers in this study still refer to attention, recall information, planning, monitoring and evaluation. For further research component of awareness and thinking can be developed regulated. Categorizing the structure of awareness and thinking regulated can also be developed. Important also involves awareness and thinking in a learning regulated.
REFERENCES