

Process of Students Thinking in Geometry's Room Problems in X Grade of Public Senior High School 1 Manyar Gresik

Sutini ¹⁾, Aning Wida Yanti ²⁾

^{1,2)} *Mathematics Education Faculty Tarbiyah And Teacher Training UINSA Surabaya*

sutinimiskun@uinsby.ac.id
aning.widayanti@uinsby.ac.id

Abstract. This study aims to describe the thinking process of students in solving the problem of geometry's room based on assimilation thinking and Piaget accommodation and Polya problem-solving stage. This research is a qualitative descriptive study. Research subjects taken by purposive sampling 4 students (1 with high math skills, 2 middle math skills, and 1 low-ability) class X MIPA SMA Negeri 1 Manyar Gresik. Technique of collecting data by written test and interview. The validity of the data is obtained by source and time triangulation. The results showed that students' thinking processes in problem solving have different thinking processes. Higher student group thinking processes are (1) students can understand the problem through assimilation, (2) students can plan completion through assimilation, (3) students can implement the settlement plan through assimilation, (4) students can re-examine the settlement through assimilation. The thinking process of middle group are (1) the student can understand the problem through assimilation, (2) the student can prepare the settlement plan for the problem that is considered easy through assimilation, (3) the student can execute the settlement plan for the problem which is considered easy through assimilation, (4) students can re-examine the settlement for problems deemed easy through assimilation. The thinking process of low group are (1) the student can't understand the problem through assimilation, (2) the student can't to prepare the problem solving plan through the accommodation, (3) the student can't to return problem solving through accommodation, (4) students can re-examine the settlement for problems deemed easy through accommodation.

INTRODUCTION

NCTM (2000) mentions that problem solving (*problem solving*) is one of the standard processes in school math learning. The benefits of problem solving are: 1. to build mathematical knowledge, 2. to solve problems both in mathematics and beyond mathematics, 3. as application tools and adaptation of various approaches to solve problems, 4. to monitor and reflect systematic problem solving process. And then Polya (1973: 5-15) describes the stages in problem solving is understanding the problem (*understand the problem*), plotting (*devise a plan*), carry out the plan (*carry out the plan*), and checked back (*look back*).

Based on preliminary research conducted on the students of class X SMA Negeri 1 Manyar Gresik shows that students have not been able to link the concepts they have to search for unknown information and have not been able to use the concept they have to develop a problem solving plan. So it can be said that the thinking process of students in problem solving is still not right. This is indicated by the results of tests given to students of class X SMA Negeri 1 Manyar Gresik when given a matter of description of the Geometry of room's that ever came out on the National Examination only 14 students from 30 students who can answer the problem correctly. The student's misconceptions include when the student is asked to determine the distance of a point in the middle of the diagonal of the field to the diameter of one of the diagonals of room's on the ABCD cube. EFGH, most students have not been able to give a name at the time of drawing the cube so that when planning the answer and completing the answer is not correct.

Piaget (1951) suggests that the development of cognitive structures of children aged 11 years and over including middle school students is the stage of formal operations. At this stage one has the ability to think abstract, reason logically, and draw conclusions from the available information. According to Piaget (1975) also explains

when a person interacts with his environment occurs the process of adaptation. Adaptation is the *equilibrium* between the organism and the environment. Adaptation is a balance between assimilation and accommodation.

Subanji (2011) suggests that the process of adaptation involves two cognitive processes of assimilation and accommodation. Assimilation is the ability to explain events based on existing schemes. While accommodation is a process of integrating the new stimulus through the establishment of a new scheme to adjust to the stimulus received. Like wise Piaget (1975) argues that when a child begins to build understanding, the brain develops a scheme. Schemes are actions or mental representations that organize knowledge. Piaget uses the concept of assimilation and accommodation to explain children's schemes in adapting. Assimilation occurs when the child enters a new scheme into existing schemes. Where accommodation occurs when children adjust their schemes with new information and experiences.

The focus of this research is the thinking process of students in problem solving room's geometry. The purpose of this study is to describe the thinking process of students in solving the problem of room's geometry in the students of class X SMA Negeri 1 Manyar Gresik. Then the use of stages Polya given to the students before the study by providing examples of problems and steps of completion of the problem using the stages polya so that students in solving the problems given are asked to use Stages Polya. The given problem is "Given the cube ABCD.EFGH has a long rib of a cm, If P is the midpoint of BC and Q is the midpoint of GH, determine the shortest distance PE to point A". The thought process in the given problem solving is illustrated in the problem structure in picture 1 as follows.

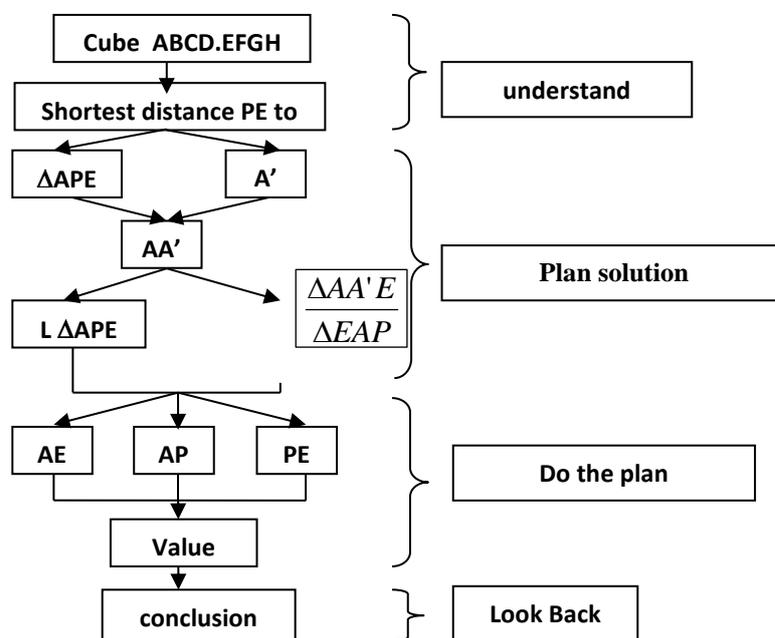


Figure 1. Structural problems

In this study the researcher paid attention to the results of the student answer sheets that were analyzed based on Polya Stages and reinforced by the interview.

METHODS

This study uses a qualitative approach because it examines the phenomenon experienced by research subjects (Moleong, 2010: 6). This study was descriptive because it describes the thinking of students in problem solving geometry of room's. This study intends to investigate the conditions, conditions or other things already mentioned, and the results are presented in the form of research reports (Arikunto, 2010: 3).

The researcher acts as a planner of activities, executing activities, data collectors, analyzers, and reporting research results. This research was conducted in SMA Negeri 1 Manyar Gresik in the even semester of the academic year 2017/2018 with the subjects of the study were 4 students of class X MIA, ie one student from high group, two students from medium group, and one student from low group. The determination of research subjects is based on the results of tests conducted prior to the research and input of the school's mathematics teacher on the student's communication skills in explaining his thought process to solve the problem.

The instrument in this study is a matter of free guided interviews and guides that are used to know the thinking process of students in problem solving. The data collected are: 1. student's answer from test question, 2. interview

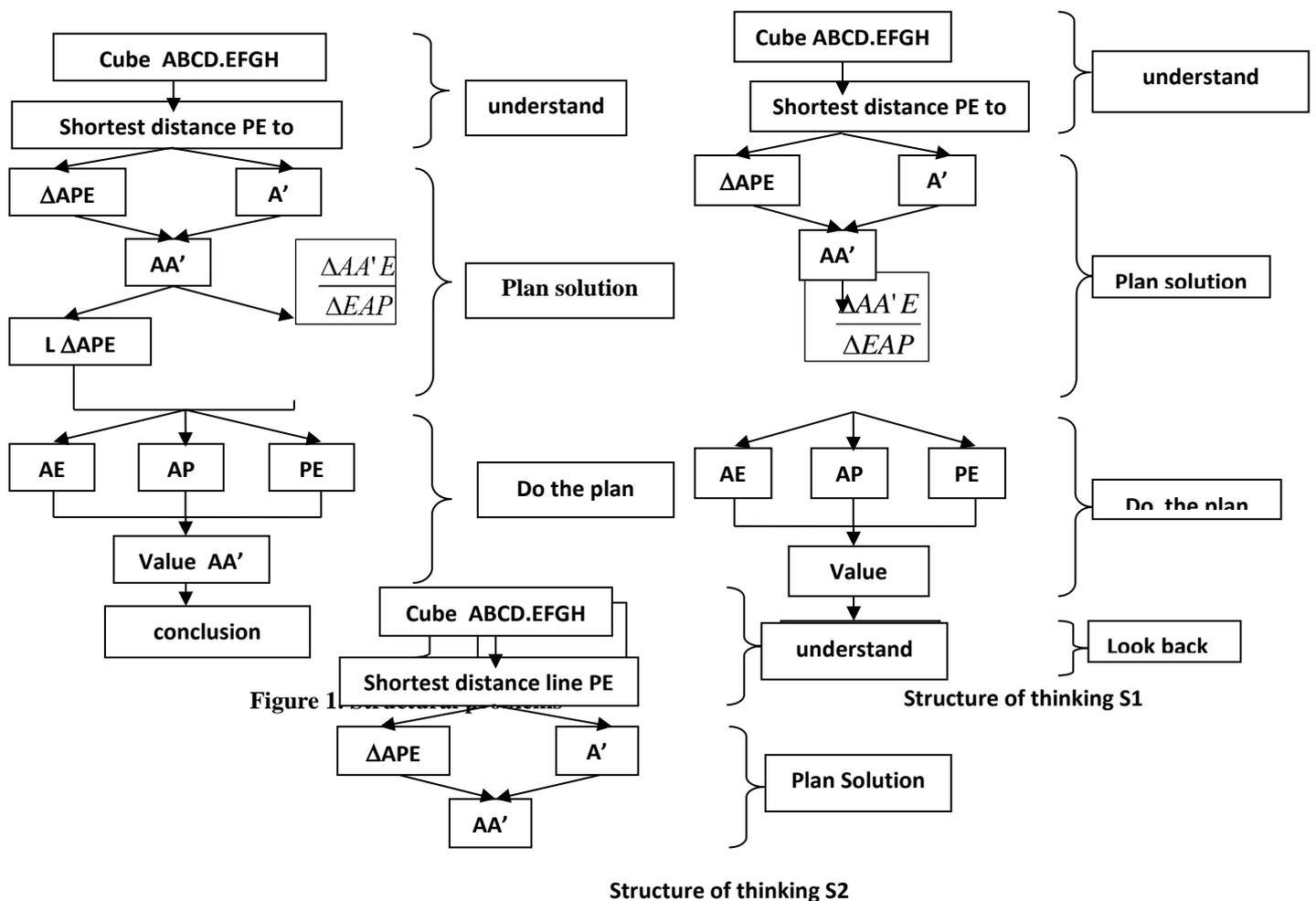
result of research subject, 3. sound recording during interview, 4. video recording during interview, and 5. photo when giving test question and interview. Before the research was conducted, the instrument was validated by two validators namely UINSA Surabaya mathematics lecturer and Mathematics teacher of SMA Negeri 1 Manyar Gresik.

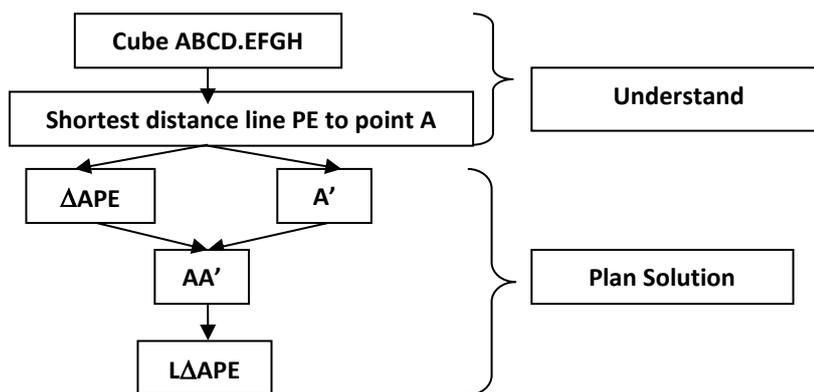
The data collection procedure used is observation, instrument validation, written test, and interview. Observation and validation of the instrument be done before penel itian. Written tests are performed to determine the subject of the study and obtain data to be analyzed. Interviews were conducted to clarify the written test in analyzing students' thinking processes based on the assimilation thinking and Piaget accommodation and Polya stages.

Data analysis in this study include analysis of validation results, analysis of test results, and analysis of interview results. Data analysis was performed based on qualitative data analysis Miles and Huberman (1984), which includes the reduction of the data (*data reduction*) that summarizes, selecting and sorting data from the results of written tests and interviews, presentation of data (*data display*) that test result data and interviews presented by Polya stages and mind assimilation and accommodation Piaget, and *verification / conclusion drawing* is making a conclusion the thinking of students in problem solving geometry room's based on the results obtained.

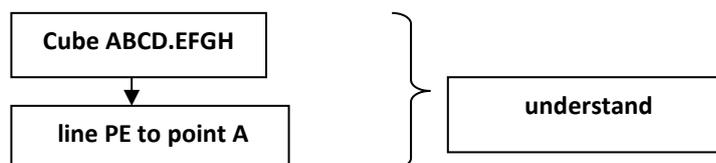
RESULTS AND DISCUSSION

This research describes the thinking process of students in problem solving geometry rooms using Poly solving stages and Piaget's assimilation and accommodation frame of mind. Problem solved in this research is the distance point to line. Furthermore, the students' thinking process was presented from three groups of research subjects, namely high group (S1), medium group (S2 and S3), and low group (S4). The structure of the problem and the structure of thinking of research subjects in problem solving is illustrated in picture 2 as follows.





Structure of Thinking S3



Structur of thinking S4

High group students (S1) explain directly the information that is known and asked correctly. The S1 completion plan leads to a correct solution. S1 explained directly the plan of completion that is using triangle comparison formula. S1 is directly convinced that the problem solving is doing right. S1 in understanding the problem, planning, implementing the problem plan and re-examining the settlement through the process of assimilation thinking.

Moderate group students (S2 and S3) explain directly the information that is known and asked correctly. S2 and S3 completion plans have not yet led to a correct solution. S2 and S3 have not been able to implement the problem solving plan. S2 and S3 are confident that problem solving is done right when in fact it is not true. S2 and S3 in understanding the problem, preparing a plan of completion, implementing the plan, and re-examining problem solving through the process of assimilation thinking.

Low group students (S4) describe directly the information that is known and asked but not true. S4 understands that the given problem is only one that is PE to A. S4 has not understood what is meant by the shortest distance. S4 can not understand the given problem and through the process of assimilation thinking. S4 said it is still confused in preparing a settlement plan. S4 tries to draw up a given plan of completion, but has not yet led to a correct solution. S4 is not correct in executing the settlement plan. It is seen that S4 has changed the implementation of its settlement plan, but this change does not lead to a correct solution. S4 said not sure about the solution of the problem. S4 work is not right yet. S4 in preparing a plan of completion, execute the plan, and re-examine the settlement through the process of accommodation thinking.

Summary of students' thinking processes in problem solving geometry rooms is presented in Table 1 below.

Table 6.5.3. Summary of Student Thinking Process in Troubleshooting Geometry Room's

Stage Polya	Research subject			
	S1	S2	S3	S4
Understanding the Problem	Students can understand the first problem through the assimilation process	Students can understand the first problem through the assimilation process	Students can understand the first problem through the assimilation process	Students can not understand the first problem through assimilation process
Preparing a Completion Plan	Students can develop their first problem-solving plan through assimilation process	Students have not been able to prepare their first problem-solving plan through assimilation process	Students have not been able to prepare their first problem-solving plan through assimilation process	Students have not been able to prepare the first problem solving plan through the accommodation process
Implementing the Settlement Plan	Students can implement the first problem-solving plan through assimilation process	Students can not implement the first problem-solving plan through assimilation process	Students can not implement the first problem-solving plan through assimilation process	Students can not implement the first problem solving plan through the accommodation process
Check again	Students can re-examine the first problem solving through the assimilation process	Students have not been able to re-examine the first problem solving through the assimilation process	Students have not been able to re-examine the first problem solving through the assimilation process	Students have not been able to re-examine the first problem solving through the accommodation process

CONCLUSIONS

Based on the results of the analysis and discussion it was found that the students' thinking process in solving different room's geometry problems at Polya problem solving stage and Piaget's frame of assimilation and accommodation in each group of students can be conclusion etc :

in problem solving have different thinking processes. Higher student group thinking processes are (1) students can understand the problem through assimilation, (2) students can plan completion through assimilation, (3) students can implement the settlement plan through assimilation, (4) students can re-examine the settlement through assimilation. The thinking process of middle group are (1) the student can understand the problem through assimilation, (2) the student can prepare the settlement plan for the problem that is considered easy through assimilation, (3) the student can execute the settlement plan for the problem which is considered easy through assimilation, (4) students can re-examine the settlement for problems deemed easy through assimilation. The thinking process of low group are (1) the student can't understand the problem through assimilation, (2) the student can't to prepare the problem solving plan through the accommodation, (3) the student can't to return problem solving through accommodation, (4) students can re-examine the settlement for problems deemed easy through accommodation.

Based on the research that has been done, the suggestions proposed by researchers are: 1. This research is only conducted on the material of point spacing, line, and field. For researchers who want further research it is advisable to be developed and applied to other subjects , 2. This research uses the theory of thought process of assimilation and Piaget accommodation and solving Polya problem separately. For researchers who want to research further it is advisable to examine the relationship between the two theories. 3. This study only describes the thinking process of students in problem solving. For further research is suggested to examine the form of

assistance *scaffolding* for each subject of research based on student error in solving the problem Geometry room's.

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