

Profile of Learners Who Have High Early Ability in Algebra Subject with Problem Based Learning

Diana Tri Purnamasari¹, Riyadi¹, and Sri Subanti¹

¹Department of Magister Mathematics Education Faculty of Teacher and Education, Universitas Sebelas Maret, Surakarta, Indonesia

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Abstract: Learners already have various levels of initial abilities when they have learned at the first time. High initial abilities belong to the learners will be very important in the learning teaching process. Due to the distinction of initial high abilities which the learners have so that the research has been done to describe about the learners who already have early high abilities in the learning mathematics with Problem Based Learning model. The subject of this research is the learners whose high initial abilities. Data of the learners whose high initial abilities have been obtained through interview and written test. Learners have been obtained learning with Problem Based Learning model after gaining the results of the written test before. Steps away from the model of *Problem Based Learning* is *first*, orientation of learners to the problem; *second*, define the problem and organize learners to learn; *third*, guiding independent investigation or group investigation; *fourth*, develop and present the work; and *fifth*, reflection and assessment. The sample is using *purposive sampling technique*. The results showed that: the use of the right model of *Problem Based Learning* can facilitate learners in understanding the material of learners who have a high initial ability above learners who have the initial ability to understand the material.

1 INTRODUCTION

The rapid development of science and technology has a major impact on various aspects of life, including education. Education can be categorized successfully if it can change the habits or basic ability of the individual to be better. This is in accordance with the opinion that “*education is the environmental influence of individuals to produce constant changes in habits, thoughts, attitudes and behaviors*” (Thompson, 1957). There are three kinds of educational paths, namely formal, non-formal, and informal education. This is in accordance with article 13 paragraph 1 of Law no. 20 Year 2003 on the National Education Stem mentions that the educational path consists of formal, non-formal and informal education that can complement and enrich each other. In accordance with article 1, paragraph 11 of Law Number 20 Year 2003 regarding National Education System, clarified by Article 1 paragraph 6 of Government Regulation No. 17 of 2010 on Management and Implementation of Education, states that what is meant by Formal Education is a structured and leveled education path which consists

of basic education, secondary education, and college.

In the academic year 2017/2018 most schools in Indonesia have implemented the curriculum 2013 to increase the potential of learners. In accordance with the Permendikbud No. 103 of 2014 states that learning in the curriculum 2013 aims to develop the potential of learners to have the ability to live as individuals and citizens who are faithful, productive, creative, innovative and effective, and able to contribute to the life of society, nation and civilized nation. Basically, every school always make new innovations in learning in order to improve the ability possessed by learners become qualified human resources. In the learning process, teachers often use learning models to improve student achievement, especially mathematics subjects.

Many learners consider that mathematics is an abstract subject and difficult to understand. This is in accordance with the opinion saying that “*it is a fact that, despite its utility and importance, mathematics is perceived by most pupils as difficult, boring, not very practical, abstract, etc., and its learning as requiring a “special ability” that is not always*

within everyone's reach" (Ignacio, 2006). One of the subjects of mathematics that require more comprehension is algebra. According to Lins states that "algebraic thinking was an intentional shift from context (which could be real, or a particular mathematical case) to structure. Thus, algebraic thinking arises when people are detecting and expressing structure, whether in the context of problem-solving concerning numbers or some modelled situation, whether in the context of resolving a class of problems, or whether in the context of studying structure more generally" (Watson, 2007). "Algebraic thinking promotes a particular way of interpreting the world. It employs and develops a variety of cognitive strategies necessary to understand increasingly complex mathematical concepts and builds upon students' formal and informal mathematical knowledge. Essentially students are using, communicating and making sense of the generalities and relationships inherent in mathematics, rather than just the identification of a single numeric answer or objective fact" (Windsor, 2009). Most mathematics teachers still use a teacher-centered, conventional learning model, so the learning-centered learning model is expected to improve the initial capabilities already possessed.

The application of the *Problem Based Learning* model was chosen because it requires active learners in the investigation and problem-solving process in learning. "PBL is an instructional (and curricular) learner-centered approach that empowers learners to conduct research, integrate theory and practice, and apply knowledge and skills to develop a viable solution to a defined problem" (Savery, 2006). PBL is a model of learning that begins by confronting students with mathematics problems. "Problem-based learning (PBL), aims students to gain autonomous learning, independent study, inquisition and problem-solving skills; and it is an approach in which individuals are confronted with simulated situations like the ones they are probable to face in their daily lives and encouraged to learn individually through self-study and research. This method being used in mathematics classes has an importance for the permanent storage of knowledge. One other factor which affects the students' learning is their efficient and proper way of study" (Karaduman, 2013). "Problem Based Learning can also develop important capabilities such as problem solving, flexibility, adaptability, and critical thinking" (Savin, 2000). The key components in *Problem Based Learning* are (a) students working in small groups; (b) student-centered learning; (c) the

educator acts as a facilitator; and (d) the use of real-life issues as a focus in learning (MacMath, 2009).

Based on interviews to teachers of SMP Negeri 3 Surakarta obtained information that the factor of a success in learning apart from the learning model used is the basic ability of learners. The basic skills that learners have as a basis for understanding new things that teachers give are often called initial abilities. This is in accordance with the opinion which states that the capabilities that have been mastered before the learning process of a particular subject begins (Dick & Carey, 1990). "Early ability of learners into three groups, namely high, medium and low" (Rahman & Maarif, 2014). The process how to categorize high, medium and low group is with how to sort the score of mathematics learning outcomes before (daily tests and middle exams semester), and classification done by classroom teachers. When we are dealing with a number of learners who are not specifically chosen for their intelligence, among them are children who are highly capable, moderate and weak.

In connection with the background that has been described, the proposed research statement is: How the learning achievement of learners who have high initial ability in learning mathematics model *Problem Based Learning*.

2 METHOD

This type of research is qualitative descriptive research. This research was conducted at SMP Negeri 3 Surakarta learners VIII C. Determination of sample using *purposive sampling technique*. This study begins by measuring the initial ability of learners using written tests and interviews determining the level of initial ability of learners. This research begins with taking the initial ability score from previous research. After that, learners are categorized into three high, medium, and low levels. Subjects in this study are two students who are categorized to have high early ability. In addition, the teacher gives problem/test to solve the learners/subject after given the model of *Problem Based Learning*. It is intended for the implementation of this research.

The data in this study was collected directly by the researchers, so that the main instrument of this study is the researcher himself who assisted with the aids instruments in the form of a written test and interview guidelines. This means that the main data sources in this study are worksheets of learners, words, and additional data such as documents and

others in algebra material. The data obtained will be described by students who have high initial ability in learning mathematics using *Problem Based Learning* model.

Data collection techniques in this study using test and non-test techniques. Non-test techniques use interview methods to obtain valid results. After the teacher gives the written test the initial ability of the learners, then the teacher provides the learning process with *Problem Based Learning* model and provide questions to solve, then continued the interview to confirm the test conducted in writing with the subject of research. Validity of data is required in qualitative research. “*Examination of the validity of data include credibility, transparency, dependence, and certainty*” (Sugiyono, 2010). Data credibility will be more valid if we use data triangulation techniques. Triangulation techniques was done by using a test and interview techniques. Data Dependence is reached by taking two subjects who already have high starting capabilities.

Collecting data in an objective way through the creation of interview guides, written test guides initial capability, and presenting data in accordance with reality is done to obtain data certainty. Data analysis was done by 2 stages, is at the stage before and in the field of analysis during the field. The analysis before the field is done by validation of instrument research in the form of test written questions. The analysis during the field is the process of searching and systematically compiling data obtained from the results of initial skills testing and interviews. Data analysis is done by data reduction, data presentation, and conclusion drawing. Data reduction is an activity that refers to the selection process, concentration of attention, simplification, extracting and transforming raw data in the field. Presentation of data is done by classification and identification of data, that is to write organized and categorized data collection so that it will enable to draw conclusions from the data. Drawing conclusions is the concluding activity of data that has been collected and verify the conclusion.

3 RESEARCH RESULT AND DISCUSSION

The determination of the research subjects based on initial ability test results using the initial ability test instrument. Gafur stated that there are

two steps to determine the characteristics of the learner's early abilities: *first*, using the available records such as the Graduation Letter of Learning (STTB) and the entrance test score; *second*, using prerequisite initial test and pre-test (Slameto, 2010). Based on the description of Gafur, it can be concluded that the initial ability can be measured by a specific initial test and the result can be used by the teacher to determine the learning model to be used.

3.1 Classification of Capability

Data on the classification of learners based on initial ability test of the learner will be presented in Table 1 below.

Table 1: Classification Capability Early Learners Class VIII C

Category	Number of Students
High	17
Medium	10
Low	5

Table 1 shows that out of 32 students of class VIII in SMP Negeri 3 Surakarta, 17 students have early ability high, 10 students entered in initial ability medium, and 5 students classified as having low initial ability. Results of initial capability classification. These learners are used as a reference for choosing a research subject. Early ability data of learners derived from the initial ability tests subjects L and B are subjects that fall into the category of learners who have the initial ability. The data obtained is used to determine the sample in this study.

3.2 The Steps of the Problem Based Learning Model

Learners will get learning with *Problem Based Learning* model, then after the completion of learning can be obtained data from learning results of written tests. The steps of the *Problem Based Learning* model include: *first*, the orientation of students to problem (teacher explains learning objectives, outlining the need for logistics (materials and equipment) required for solving the problem, encourage students to engage in problem-solving activities that have been students and teachers, as well as self-selected by learners); *second*, defining the problem and organizing students to learn (teacher helps students define and organize the tasks learners in learning to solve problems, to

determine the theme, schedules, tasks, and etc); *third*, to guide self and group investigation (teacher encourages learners to hypothesize, collect information, data relevant to problem-solving tasks, conduct experiments to obtain information and solve problems); *fourth*, to develop and present their work (teachers assist students in planning and preparing a work that is relevant for example reports, help share the task with friends in his group and others, then students presented works as the proof of troubleshooting); and *fifth*, reflection and assessment (teacher guides students to reflect, understand the strengths and weaknesses of their reports, notes in memory of important points or concepts related to problem solving, analyzes and assesses the processes and outcomes of problem investigations)(Warsono & Hariyanto, 2012).

Table 2: Initial Ability of Learners

Steps of Early Problem Based Learning Capabilities	Subject L	Subject B
Student Orientation to Problems	The subjects choose to work on algebraic issues from the easiest one	Subjects choose to work on algebraic issues from the most difficult one
Defining Problems and Organizing Students to Learn	Subjects have been able to organize problems and some solutions from algebra problem	Subjects have been able to organize problems and solutions of algebraic material
Guiding Independent Investigation as well as Group Investigation	The subject is easy in solving complex algebra problems	Subject takes a little time to solve the complicated problem itself
Developing and Presenting Works	The subject can work on the problem in some way of completion, but it is little difficult to present in front of the class	Subjects can work on and present algebra material smoothly in front of the class
Reflection and Assessment	Subjects can work on issues that are given, but it is difficult to convey to other friends	Subjects are less efficient at times in solving algebra problems, but can solve the

		problems given
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Subjects L and B solve algebra problems using *Problem Based Learning* model well. Subject L can solve algebraic problems from problems he finds easy in several ways. In contrast to the subject B who worked on algebraic issues from which he considered the most difficult. This causes subject B to spend more time than subject L in solving the problems. Subject B can present the questions done in front of the class well and smoothly, while the subject L is difficult to convey/explain how to do the questions in front of the class.

Based on the results of this study the subject of L and B has a high initial ability to complete learning using *Problem Based Learning* model well. Ruseffendi said that “*from a group of children who are not specifically selected there are a number of gifted children who are above moderate-minded learners, who are the same number as low-ability children*” (Herdian, 2010).

4 CONCLUSIONS AND SUGGESTIONS

Early ability of the students/subjects L and B are high and can meet some of the steps of learning *Problem Based Learning* model. The steps of the *Problem Based Learning* model are: *first*, the student orientation to the problem (teacher explains the learning objectives, outlines the logistical needs (materials and tools) needed for problem solving, encourages learners to engage in problem-solving activities that students have selected together with teachers, as well as those chosen by the learners themselves); *second*, defining the problem and organizing students to learn (teacher helps students define and organize the tasks learners in learning to solve problems, to determine the theme, schedules, tasks, and others); *third*, to guide self and group investigations (teacher encourages learners to hypothesize, collect information, data relevant to problem-solving tasks, conduct experiments to obtain information and solve problems); *fourth*, developing and presenting their work (teacher assists students in planning and preparing a work that is relevant for example reports, help share the task with friends in his group and others, then students presented works as a proof of troubleshooting); and *fifth*, reflection and assessment (teacher guides students to reflect, understand the strengths and weaknesses of their reports, notes in memory of

important points or concepts related to problem solving, analyzes and assesses the processes and outcomes of problem investigations). Subjects L and B solve algebra problems using *Problem Based Learning* model well. Subject L can solve algebraic problems from problems he finds easy in several ways. In contrast to the subject B who worked on algebraic issues from which he considered the most difficult. This causes subject B to spend more time than subject L in solving the problems. Subject B can present the questions done in front of the class well and smoothly, while the subject L is difficult to convey/explain how to do the questions in front of the class. Teachers should be able to design learning activities tailored to the level of each child's initial ability. For learners who have a low and moderate initial ability, it is best to apply a learning model that can improve the initial ability to better understand the material to be taught.

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