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EXPLORATION OF THE DIDACTIC SITUATION OF LINEAR EQUATIONS IN SMP SUCI MURNI MEDAN

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ABSTRACT

One way to design good learning is to pay attention to the possibility of the learning flow that will occur in the classroom and the possible processes that students will go through, then make up what the teacher should do when this happens. These possibilities are also called the hypothetical learning trajectory. In this study focused on the design of mathematics learning on the material system of two-variable linear equations in grade VIII junior high school involving one class of 18 people. The instruments used were tests and non-tests. This study aims to explore pedagogical phenomena to formulate alternative learning designs for linear equations through problem-based learning. Perspectives and pedagogical encouragement about teaching mathematics during the learning process are reflected in the deepest thoughts and emotions of students and teachers. The research method uses a qualitative type of didactical design research, which is a type of learning design research where learning designs can be formulated from several perspectives, namely the theory of learning trajectories and their obstacles and learning situations during the learning process. The stages carried out in this research are: 1) introduction and analysis of the problem; 2) analysing the curriculum related to the mathematics textbooks used; 3) Identify the characteristics of learning obstacles and learning barriers; 4) identify didactic situations during learning.The results of the research yielded the characteristics of learning trajectories and learning obstacles, which were used as the basis for the pedagogical situation of learning linear equation material through exploratory problem-based learning.
Keywords: Mathematics, PBL, Didactic, Learning Trajectory

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PRELIMINARY

Minister of Education and Culture Number 20 (2016) states that the purpose of learning mathematics at the secondary level focuses on four kinds of abilities: the ability to understand concepts, problem solving, reasoning, and mathematical communication skills. In learning, the role of the teacher is very important in order to achieve the learning goals (Kemendikbud, 2016). Teachers play an important role in motivating students to play an active role in building meaningful understanding. (Ayuwanti et al., 2021) stated that with these different abilities, students will be happier and more interested in learning mathematics, so that they will find it easy to understand the subject matter.

According to Sari, N (2022), the reality on the ground is that in the learning process in general, the learning that is carried out by the teacher is still classical, namely that learning begins by working on sample questions, and then students are directed to understand the way the teacher solves these examples (Sari, Saragih, Napitupulu, et al., 2022). Such a situation will limit the development of students' abilities. Limitations refer to the learning process in the classroom, which is an obstacle to learning for students in the epistemological realm (Sarah et al., 2017; Sulistyowati et al., 2017). This causes students to find it difficult to apply the knowledge they have.

Not many people think that when learning mathematics, especially linear equations, it is necessary to explore the situation. The meaning is not only "reading the formula", but more than that, students must be able to interpret what concepts are contained in the material of linear equations and apply the formula to solve the problems or questions given, especially in non-routine questions. Thus, in designing mathematics learning, it is necessary to explore learning situations that help students construct their understanding of certain material. The purpose of this study is to deepen the learning of mathematics in systems of two-variable linear equations material through problem-based learning.

Explaining in more detail that this study was formulated from three perspectives, namely learning trajectories and learning obstacles, as well as the contextual theory of learning material on linear equations through problem-based learning. The reason for using problem-based learning in this research is because there have been many studies that have proven that problem-based learning can improve students' ability to solve problems (Moallem, 2019; Perdana & Isrokatun, 2019; Saputro et al., 2020; Sari, Saragih, Rahmadani, et al., 2022; Vera et al., 2021). Apart from that, from the stages passed in problem-based learning, it is believed that it can lead students to think from real-world concepts to abstract concepts (Moallem, 2019). This research also offers various solutions to problems that may arise when learning mathematics. These issues limit students' potential to develop competence through exploring these didactical situations.

Learning Trajectory

The learning trajectory is a series of processes or activities carried out by a student on a particular material that is naturally appropriate to his level of ability (Kara et al., 2018). If the teacher prepares a learning trajectory, it is certain that the learning process will take place well and meaningfully, in accordance with the goals of learning mathematics (Wijaya & Doorman, 2021). The learning trajectory also refers to the sequence of activities designed by the teacher to convey certain material based on the level

of student ability according to the order of the material being studied to produce optimal learning (Haqq, 2020).The learning path consists of several important steps in learning a particular material. Each of these steps is interrelated; for example, a new step is the result of a previous step. When designing the learning trajectory, the teacher must consider the objectives of the lesson and what activities students will experience (Ferreira & Silva, 2019). The learning trajectory is the flow of students' thinking abilities and their understanding of learning concepts (Rezky & Jais, 2020). Teachers need to pay attention to the flow of students' thinking in learning when designing learning designs that are in line with the goals of student-centered mathematics learning. (Khoirudin & Rizkianto, 2018) emphasize that learning trajectory is a detailed explanation of the order of thinking, reasoning styles, and strategies of students participating in learning a topic, including how students deal with all teaching assignments and social interactions.

When constructing learning trajectories, teachers can create hypothetical learning trajectories (HLT). HLT is the assumption of the learning process, which includes the learning process. Aside from being a tool for linking material to specific learning, HLT can serve as a guide for material to be developed further. Thus, HLT is the first step in designing learning around certain materials that have been previously conceptualized by the teacher in the classroom. The description of the HLT component by Risdiyanti & Prahmana (2018) states that the Hypothetical Learning Trajectory (HLT) consists of three main components: 1) the purpose of learning, which will determine the direction of the learning process; 2) a set of tasks or activities that contribute to the achievement of learning objectives; and 3) conjectures or hypotheses about how students think and learn (Risdiyanti & Prahmana, 2018). Because HLT is still hypothetical or speculative, it is not necessarily the same as the actual process that occurs in the classroom. Teachers need to continue to revise HLT aspects. So the HLT design is a continuous learning cycle. In HLT, modifications not only occur when the learning process is planned, but HLT must be continuously revised, enhancing the previously assumed learning trajectory after implementation in the classroom (Rezky & Wijaya, 2018). Therefore, the design of learning trajectories in the learning process will provide great benefits, especially for mathematics teachers.

Learning trajectories are related to a number of learning activities spanning the entire spectrum and appropriate to classroom settings, and instructional theory comprises frameworks that inform the development of learning trajectories in specific classroom settings (Hendriana et al., 2019). A quality learning trajectory is a series of learning

processes that allow students to have meaningful learning experiences (Liu, 2020; Maifa, 2021). During this process, students have the opportunity to think and reflect on the learning process and the role of a teacher as a facilitator so that they can build their own ideas and learn. Thus, in this research, a learning trajectory will be designed for system of two-variable linear equations material for Grade VIII students in junior high school. The design results can later be used by the teacher as a reference for the development of HLT designs in other materials for learning mathematics.

Learning Obstacles

Learning obstacles or learning disabilities are divided into three types: 1) individual obstacles, namely difficulties that exist because learning is not carried out at the level of students' thinking abilities; 2) cognitive obstacles, namely, students having difficulty learning because of the situation and knowledge that is still limited. 3. Obstacles to teaching based on learning difficulties faced by students because of the learning done by the teacher (Sulistyowati et al., 2017). These learning obstacles are studied according to the stages of problem-based learning, which include five stages of learning activities. In each learning process, the teacher uses relevant textbooks related to systems of two-variable linear equations material.

Didactical Situation Theory

Instructional Situation Design is a situational design designed to minimize the possibility of student learning obstacles (one of which is student anxiety about mathematics). Meanwhile, according to Brousseau's view, teaching situation theory combines three processes experienced by students in the learning process, namely action, formation, and verification. These three instructional situations direct students to directly experience a meaningful learning process. In addition, there is also a process of adaptation and acculturation. According to Brousseau the process of adaptation in learning is experienced by students in additional situations, while acculturation is experienced by students in learning situations (Sulistyowati et al., 2017). The learning situation to be designed is the situation in the classroom using problem-based learning with five stages of the learning process.

Problem-Based Learning

Problem-based learning is a very effective way to develop high-level thinking processes (Moallem, 2019). This learning can help students process various pieces of information in their minds and build or construct their own knowledge about everyday life around them. This kind of learning is suitable for developing basic or complex knowledge.

This learning is also based on constructivist theory. In this lesson, it starts with presenting real-world problems that require collaboration between students to solve, and then the teacher becomes a guide for students in outlining a plan for solving a problem into several stages of activity. A teacher gives an example of using the skills and strategies needed so that the task can be resolved. A teacher must be able to create a situation or atmosphere in the classroom flexibly and be oriented towards student investigation efforts.

Problem-based learning is a very effective learning method for developing higher-order thinking processes. The use of this learning can help students process different information in their minds and create or build their knowledge about everyday life around them. Such learning is suitable for developing basic or complex knowledge. This research is also based on constructivism theory, which begins by presenting real problems that require cooperation between students to solve. The teacher then becomes a guide for students to outline problem-solving plans for several stages of activity, and the teacher provides examples of the skills and strategies needed to solve the problem. The teacher must be able to flexibly create a classroom situation or atmosphere and direct student research.

Arends states that the characteristics of problem-based learning are: 1. Asking a problem or question Problem-based learning that organizes teaching around problems or questions must meet several criteria, including being authentic, clear, and easy to understand. 2. Appropriate based on learning objectives: that is, the problems that are formulated should cover all subject matter and be taught, both in terms of the use of time, space, and available resources, so that they are in accordance with the stated learning objectives. 3. Useful: This means that the problems given can improve students' thinking and problem-solving skills and motivate them to learn. 4. Focus on interdisciplinary relationships. Problems are explored, and real problems are selected so that students can view them from different disciplines while solving them. 5. Authentic inquiry Students must be able to analyze and define problems, formulate hypotheses and make predictions, and analyze information and conduct experiments on certain problems. 6. Finishing the product and presenting it The resulting product can be in the form of reports, physical models, videos, or computer programs. 7. Collaboration. Problem-based learning can be seen from its characteristics, namely students working in pairs in a small group (Trianto, 2014).

Based on the characteristics mentioned above, Arends also argues that the instructional goals of problem-based learning are to help develop research skills and

problem-solving skills, to provide experiences related to the role of adults, and to enable students to believe in their own thinking abilities and become independent. Problem-based learning is not designed to help teachers provide complete information to students, but this learning is developed to help students develop their ability to solve problems as well as their intellectual skills. Besides that, students can learn the role of adults by involving students in real-world experiences or creating simulations, and this learning makes students capable of being independent learners. Arends argues that there are five steps in problem-based learning, namely: 1) student orientation towards problems; 2) student organizations for learning; 3) guiding individual and group investigations; 4) developing and presenting works; 5) analyzing and evaluating the problem-solving process (Sari, Saragih, Rahmadani, et al., 2022).

From the explanation above, it can be seen that this didactic situation is important for students to know the stages that they go through during the learning process. Previous research has been conducted to identify existing didactic situations with a humanistic approach (Haqq, 2022). Apart from that, the same research related to the didactical design research method has also been carried out by Annizar, Sarah, and Haqq (Annizar & Suryadi, 2016; Haqq, 2020, 2022; Sarah et al., 2017). This research is different from the previous ones because this study uses a problem-based learning model to obtain didactic situations and learning trajectories that will be produced by students during the learning process. Problem-based learning is believed to be able to improve students' abilities in mathematics. So in this research about the exploration of didactic situations and material linear equations through problem-based learning.

METHODS

In this study, the method used was a qualitative method of the didactical design research type, which is a type of learning design research where learning designs can be formulated from several perspectives, namely the theory of learning trajectories and their obstacles as well as the learning situation during the learning process.

According to Suryadi, there are three stages in didactical design research: didactical situation analysis, metapedidad active analysis, and retrospective analysis (Fitrianna et al., 2019). This study focuses on the design and preparation of the didactic design material for a system of two-variable linear equations through problem-based learning related to the obstacles students pass during the learning process.

According to Suryadi, there are three stages in didactical design research, but this research is only in the first stage due to time constraints in completing this paper. The steps that will be carried out in the didactic situation analysis stage are:

1) identification of learning trajectories and learning obstacles based on analysis of material in textbooks, interviews with teachers and students, as well as observational material and class analysis during the learning process
2) The identification of didactic situations through problem-based learning is carried out through the collection and analysis of documents as well as interviews with teachers(Haqq, 2022).

According to Suryadi, the research begins by exploring the learning process, learning disabilities, and formulating the initial design of the teaching situation(Haqq, 2020).

The research subjects were 18 grade VIII students in junior high school. The instruments used were tests and non-tests. Test instruments are arranged to identify student learning obstacles. Non-test instruments in the form of observation sheets and interviews. Non-test instruments are used to assess the suitability of learning obstacles with teaching materials and the implementation of the learning process. The test and non-test instruments have been declared valid. Research data analysis techniques are qualitative in nature. Qualitative analysis was carried out during the data collection process until the results of the collection were known. For more details, the steps of this research can be seen in Figure 1 below

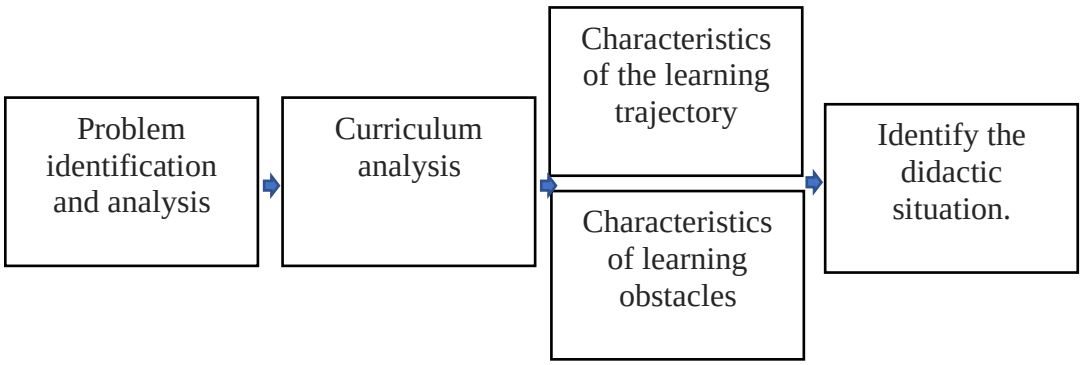

Figure 1. Research Steps

RESULT AND DISCUSSION

Exploring the pedagogic context of learning material on a two-variable linear equation system through problem-based learning aims to find out:

1) What are the characteristics of the learning trajectory and learning obstacles faced by

students in understanding the concept of the linear equation material?

2) What are the characteristics of the didactic situation of problem-based learning in the matter of systems of two-variable linear equations?

To analyze this, a study of learning trajectories and learning disabilities or obstacles was carried out in teaching materials on two-variable linear equations through document analysis and interviews with teachers and students.

1. Learning trajectory and Learning Obstacle

1.1 Learning Trajectory

For the system of two-variable linear equations material through problem-based learning Some of the processes used to identify student learning trajectories in this study are student learning trajectories in the System of two-variable linear equationsmaterial through problem-based learning analysis, which includes 3 processes namely a) analyzing the learning resources used by students, as well as teacher explanations and the relevance of reference books used with the System of two-variable linear equations material, also known as Cognition-gap; b) The analysis phase which dissects the material or explains what material students must acquire is also called material repersonalization; c) The process of rearranging the learning trajectory that students will go through.

Before discussing the teaching materials, the core competencies and basic competencies of the System of two-variable linear equations materials for class VIII junior high school based on the 2013 curriculum are explained first. From core competencies and basic competencies to K13 competencies. from core compeapply, andetencies it shows that students are able to understand, apply and be able to reason about the material of a system of two-variable linear equations. In addition, students are able to explain and solve the material related to the two-variable system of linear equations. From core competencies and basic competencies is used as a reference in identifying learning trajectories that occur in the classroom. The three processes are described below:

a) Cognition Gap

Based on core competencies and basic competencies from the System of two-variable linear equations material, understanding the the system of two-variable linear equations concept, the concept map contains a description of the material that students need to know. Based on the existing concept map, the researcher divided it into five learning objectives for five sessions. During these five sessions, the author will describe the process of learning activities carried out by students in the classroom. Based on the books used by teachers and students, including: 2018 Revised Edition Mathematics

Package Book for class VIII Junior High school. This book is used in the first semester of class VIII and is published by the government. Furthermore, in the curriculum 2006 Mathematics book, the standard of competence in System of two-variable linear equations material in this book is to understand System of two-variable linear equationsand use it to solve problems. In addition, the curriculum 2006 learning process emphasizes more cognitive, psychomotor and affective aspects. Besides that, in the curriculum 2006 , the standard learning process does not show a clear and detailed sequence of teaching, so that it can provide opportunities for various interpretations, and the learning that takes place is ultimately teacher-centered.

Meanwhile, the 2013 curriculum focuses on competencies, including communication skills and critical thinking. The system of linear equations with two variables study in the 2013 curriculum includes an "observation" aspect, namely observing everyday problems related to linear equations of two variables and how to construct linear equations of two variables from the problems given. Furthermore, the "asking" aspect is asking daily questions about system of linear equations with two variables and how students solve problems so that there are solutions. Also information gathering, where students are invited to relate existing information from existing problems to everyday problems. The next aspect is "inference,", where students analyze everyday problems related to the form of a system of linear equations of two variables, analyze differences in equations, and analyze mathematical models of problems related to system of linear equations with two variables. Finally, the aspect of "communication", in which students can present learning outcomes that have been completed orally or in writing, what material has been learned or find new strategies from related knowledge to determine the completion of linear equations in two variables, create equations or mathematical models for existing problems with answers showing results, and be able to summarize material from a series of learning activities that have been carried out, The use of the 2013 curriculum book is recommended by the government, but there are obstacles to presenting the learning concept. Teachers need to digest the concept before communicating it to students. The system of linear equations with two variables concept map of the 2013 curriculum shows that the material is structured and layered on top of each other. Books that are in accordance with the 2013 curriculum have the characteristics of chapter-based textbooks, and each textbook is interrelated and requires continuous learning. At the beginning of the chapter, each material is presented with an interesting understanding, and its benefits in everyday life are explained with examples from students' lives. This can

arouse students' interest in studying the material seriously. With the given learning process, students must be able to construct their understanding with the help of various stages in the learning process. Students are expected to be able to develop and explore their own knowledge. This is in accordance with the expectation of "student-centered" teaching, where the teacher is only a facilitator and students are active in the learning process.

In this study, researchers used a problem-based learning model in the learning process. The first system teacher gives apperception in the form of recalling the previous lesson, then motivates students by conveying the benefits of learning the system of two-variable linear equations material. Several questions are provided in the book with the aim of equalizing the knowledge students have so that learning can be focused and not drag on or take too long. Students are then given examples of questions related to previously studied material, with the aim of gaining an initial understanding of the students' mastery of the material. The next stage of the core activity is the problem-based learning process, which consists of five stages:

1) Student orientation on the problem: the teacher guides students in the activities to be carried out in answering the questions in the student worksheet.
2) organizes students to learn: at this stage, the teacher guides students to form heterogeneous study groups with 3–4 students, then distributes worksheets to each group;
3) guiding individual or group investigations: the teacher guides students in connecting the activities carried out with the system of two-variable linear equations material and guides students to build their own knowledge regarding the material. Furthermore, the teacher directs the students to solve the problem of the object as a certain variable and make a mathematical model of the problem. If students have been able to construct their own knowledge when solving problems, it will be easier for them to remember this in the future. However, in the 2013 curriculum book, there is very little in-depth information regarding the system of two-variable linear equations material, so students have difficulty understanding it.
4) developing and presenting the work: the teacher directs each discussion group to present the problem-solving process that has been done;
5) Analyzing and evaluating the problem-solving process: the teacher directs students to check the completion of the student worksheet and helps them evaluate, reflect, communicate, and ask questions with the teacher or other

groups. The last stage is closing; the teacher guides the students to make a summary of the system of two-variable linear equations material. In this book, the questions are classified as C4, or analyze. From the book, it can be concluded that the learning trajectory might cause learning obstaclesto the ability to solve mathematical problems. It can be seen that the book does not have a simple definition of the meaning of equations and systems of equations, so students may get confused. The book does not explain the definition of prerequisites that must be mastered by students, but in general, students forget that it becomes a cognitive gap in the system of two-variable linear equations material.

b) Material Repersonalization Analysis

Reviewed based on what material must be obtained by students related to the system of linear equations of two variables. Repersonalization is mapping the relationships between concepts in each material (Haqq, 2022). The repersonalization process begins by listing what material students must acquire regarding a system of two-variable linear equations. Among these materials, namely the concept of linear equations of two variables, solving systems of linear equations with the methods offered are graphical, substitution, elimination, and combination methods. In solving problems, students more often use their skills in algebraic operations.

c) Material Reconstruction

At this stage, a rearrangement of the learning trajectories that students will follow will be carried out, namely, first students will understand the concept of a linear equation of two variables, then students will make examples with certain variables, and then students will make a model or mathematical equation of the given problem. After that, students solve the problem by choosing the right strategy. Some of the strategies used in solving system of linear equation are graphical methods, substitution methods, elimination methods, and combined methods. For more details, the stages of this reconstruction can be seen in the following figure:

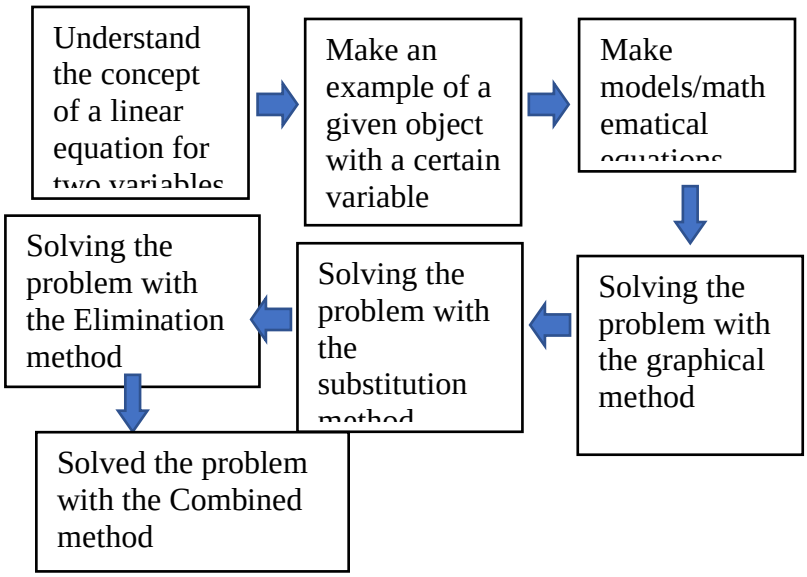

Figure 2. The System of Two-Variable Linear Equations Material Reconstruction

Figure 2 above is the learning trajectory stage that students will go through in understanding the material of the system of equations of two linear variables.

1.2. Learning Obstacles

Fahrilianti argue that there are some difficulties students experience while understanding the System of two-variable linear equations material, namely in determining variable values in the System of two-variable linear equations equations and difficulties in solving word problems because students must be able to construct the problems given into mathematical models or equations(Fahrilianti et al., 2019). In this study, the search for learning obstacles can be done through a set of problems in the form of word problems given to students who have previously been taught the System of two-variable linear equations material. Students will be presented with problems related to solving the System of two-variable linear equations using various methods, including graphical methods, substitution, elimination, and combination methods. The series of problems is compiled based on the basic competencies in the 2013 revision of the 2018curriculum. The number of questions given is five, with different levels of difficulty. This is done in order to detect learning obstaclesexperienced by students in each basic competency. The time given to students to answer questions is 90 minutes. Based on a search of student learning obstaclesthrough the questions given as well as from the results of interviews and observations, potential learning obstacles were found, as shown in Table 1 below.

Table 1. Obstacles to Learning the System of Two-Variable Linear Equations Material

(Types of Learning Obstacle)	**Description of Findings**		**Anticipation**	
Ontogenic obstacle	1	1 The practice questions do not reach the basic competencies you want to achieve	1	he teacher should pay attention to the basic competencies to be achieved.
	2	Students cannot choose which strategy to use	2	The teacher provides scaffolding in the form of questions related to the types of settlement strategies and when to use these strategies.
	3	Students are wrong in making a mathematical model/equation of the given problem	3	Direct students to solve problems related to existing variables.
Epistemolog	1	Students still have difficulty in operating algebraic forms	1	Give students practise questions on algebraic operations before starting learning.
ical obstacle	2	Students make mistakes in arithmetic operations	2	The teacher can provide scaffolding.
	3	Students try to replace variables with a certain value and this is not efficient	3	The teacher may remind students if they feel it is useless.
Didactical	1	Students do not understand the concept of algebra	1	try to repeat the previous lesson
obstacle	2	Students cannot think of objects as certain variables	2	Make an illustration in front of the class with concrete objects.
	3	Students do not	3	Associate it with real-life examples of

(Types of Learning Obstacle)	Description of Findings	Anticipation
	understand the concept of a system of linear equations	students
	4 Students imitate the answers to the existing sample questions	4 Make questions that are not routine
	5 Students have not been able to construct the system of two-variable linear equations concept	5 The teacher provides more examples related to the real world of students so that the construction process from concrete to abstractly related material can be understood by students.
	6 Students have difficulty combining solving methods	6 Direct students to use two existing methods in one solution.
	7 Students have difficulty distinguishing between linear equations and systems of linear equations	7 Regarding the basic concept of the material, the teacher may provide scaffolding with relevant examples.
	8 Students tend to follow the steps taken by the teacher in solving problems	8 Give non-routine questions so that the pattern of work is different.

Table 1 above explains the learning obstacles experienced by students while studying the two-variable linear equation system material obtained from the results of observations and interviews.

2. Didactic Situation Material on Linear Equations of Two Variables Through Problem-Based Learning

The following describes the didactic situation in schematic form to make it easier to understand.

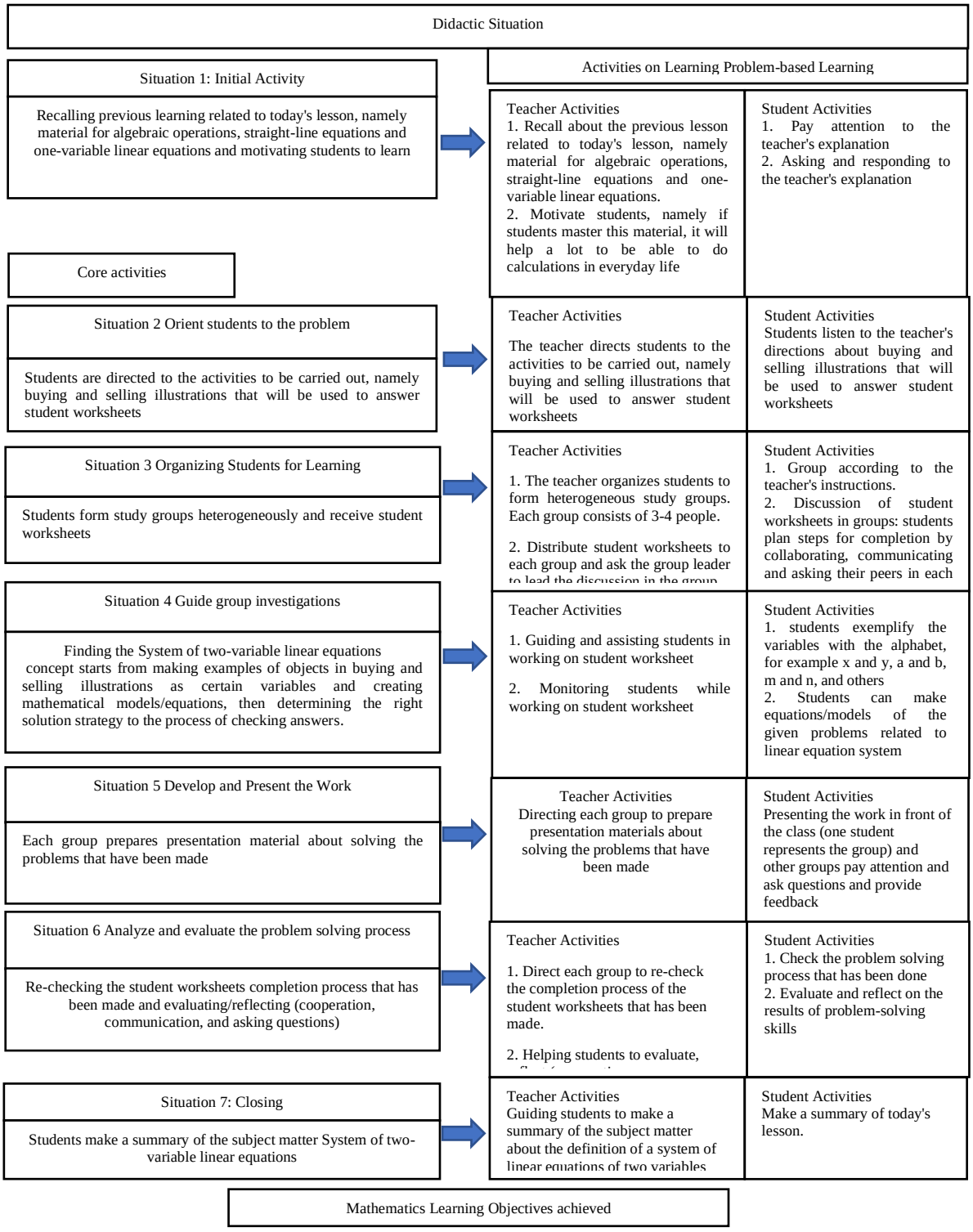

Figure 3. Schematic of The Didactic Situation of The System of Two-Variable Linear Equations Material Through Problem-Based Learning

Figure 3 above explains the didactic situations that occur during class learning. In didactic situations through problem-based learning, it was found that there were 7 situations that students would go through, including initial activities, core activities, which included: orienting students to problems, organizing students to study, guiding investigations, developing and presenting work, analyzing and evaluating the problem-solving process, then closing. In order to make it clearer, the following describes in detail every situation and activity carried out by the teacher and students.

A series of didactic situations from one to another in learning material on a system of two-variable linear equations through problem-based learning must be able to support one situation hierarchically and another. From Figure 3 above, it can be seen that the series of activities students go through are interconnected with each other; if the previous stages have not been completed, they cannot proceed to the next stage. Each situation that occurs is based on the stages of problem-based learning. In line with Fitriana (2019) by using problem-based learning on calculus material(Fitrianna et al., 2019).

CONCLUSION

The results of the analysis of the learning trajectory of the System of two-variable linear equations material based on junior high school class VIII Curriculum 2013 textbooks, learning is focused on understanding the concept first then determining the solution to the the System of two-variable linear equations problem by choosing the appropriate method. The learning flow formed from the System of two-variable linear equations material through problem-based learning is in accordance with the stages of the student's understanding process in solving problems related to the System of two-variable linear equations material. Observations on learning obstacleswere obtained: 1) ontogenic obstacles including a) practice questions did not reach the basic competencies to be achieved; b) Students cannot choose which strategy to use; c) Students are wrong in making a mathematical model/equation of the problem given; 2) epistemological obstacles, including: a) students still have difficulty operating algebraic forms; b) students make mistakes in arithmetic operations; c) students try to replace variables with a certain value, which is not efficient; 3) didactic obstacles including a) Students do not understand algebraic concepts; b) Students cannot think of objects as certain variables; c) Students do not understand the concept of a system of linear equations; d) Students imitate answers to existing sample questions; e) Students have not been able to construct the the System of two-variable linear equations concept; f) Students have difficulty combining solving

methods; g) Students have difficulty distinguishing between linear equations and systems of linear equations; h) Students tend to follow the steps taken by the teacher in solving problems. Furthermore, the results of a series of didactic situation activities in the System of two-variable linear equations material through problem-based learning have the potential to achieve the goals of learning mathematics, especially in the System of two-variable linear equations material.

Implications

In accordance with the results of this study, the implications of these results are as follows:

1. Theoretical Implications: Choosing the right learning model can affect student achievement. For mathematics, there are differences in learning achievement between learning using problem-based learning models and other models.
2. Practical implications: The results of this study are used as input for teachers and prospective teachers. Improve yourself in relation to the teaching that has been done by paying attention to the right learning model in the learning process in the classroom.

Research Limitations and Suggestion

Based on the results of the research and the researcher's direct experience in this research process, there are several limitations to the research, which are deficiencies that need to be continuously improved in subsequent studies. Some limitations in this study, among others:

1. According to Suryadi, the implementation of learning design research was divided into three stages: didactical situation analysis, metapedidad-active analysis, and retrospective analysis. However, in this study, it was limited to the first stage, namely the didactic situation analysis stage. So further research can be carried out to complete the three existing stages so that the results are more optimal in order to provide solutions to learning mathematics at school.
2. The number of respondents is only one class, namely 18 students; of course, it is still insufficient to describe the real situation.

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