



## Application of Problem-Based Learning Model to Students' Mathematic Communication Ability

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### ARTICLE'S INFORMATION

#### *Article history:*

Received: Aug-08-2021

Reviewed: Aug-30-2021

Accepted: Nov-05-2021

**Keywords:** Mathematical Communication Ability, Mathematics, Problem Based-Learning (PBL)

### ABSTRACT

This article describes applying the Problem-Based Learning (PBL) model on Mathematical Communication Ability. The research in this journal is an experimental study using pretest-posttest control group design with a population of seventh-grade students of SMP Negeri in Kuantan Singingi Regency, divided into three school levels: high, medium, and low schools. From each school, two classes were randomly selected as the experimental class and the control class. The research instrument was the Mathematical Communication Ability test questions. The data collection technique is done by testing. Data were analyzed using t-test and one-way ANOVA. The results showed an effect of PBL application on mathematical communication skills in terms of all students. The effect of PBL application on mathematical communication skills in terms of school-level shows that for the high school level, students are better than students using conventional learning, while at the medium and low school level, there is no significant effect.

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## INTRODUCTION

Education is a conscious and planned effort to create a learning atmosphere and learning process. Students actively develop their potential to have religious-spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves and society [1]. Education that can support development in the future is education that can develop students' potential so that students can face and solve problems or life problems they face. Therefore, it is necessary to equip students with abilities in subjects with several disciplines that must be mastered. The subjects given at the elementary and secondary school levels include a group of science and technology subjects. One of these subjects is Mathematics. Learning mathematics is one of the means in shaping students to think naturally. This is in accordance with the function of learning mathematics, namely developing abilities that can be applied in everyday life. Learning mathematics, if successful, will produce students who have problem-solving skills, communication skills, reasoning abilities, understanding abilities, and other abilities well and can take advantage of the usefulness of mathematics in life [2]. Learning mathematics can form patterns of thinking that are logical, systematic, critical, and creative. For this reason, learning mathematics needs to be done by getting students to be actively involved in constructing their knowledge effectively, and having fun.

The teacher's task and role is no longer a provider of information (transfer of knowledge), but as a motivator for students to learn (stimulation of learning) to construct their own knowledge

through various activities, including aspects of communication. The teacher's emphasis on the mathematics learning process must pay attention to the balance between doing (doing) and thinking (thinking). Teachers must raise students' awareness in carrying out learning activities so that students have the skills to do something and understand why the activity is carried out and what its application is. The teacher as a facilitator must be ready and responsible for creating an atmosphere or situation that allows the thinking process to occur in students [3]. Until now, the teacher's role in building students' mathematical communication skills, especially in learning mathematics, is still very limited

The results of the 2015 Program for International Student Assessment (PISA) study stated that the average achievement score of Indonesian students for mathematics was ranked 62 out of 70 countries in the world. While the Trends in International Mathematics and Science Study (TIMSS) results in 2015, Indonesian students were ranked 45th out of 50 countries. This fact shows that the ability of Indonesian students in all aspects of mathematical ability is still weak. Students can generally master routine questions, simple computations, and measure knowledge in everyday contexts but are unfamiliar with questions requiring application and reasoning. Therefore, it is necessary to strengthen the ability to integrate information, draw conclusions, and generalize the knowledge possessed to other things [4]. Reasoning ability is necessary for learning mathematics, emphasizing aspects of Mathematical Communication Ability (KKM) [5].

In line with the statement above, low mathematical communication skills have an impact on student learning outcomes. Facts in the field that the author found during observations at SMP N 1 Teluk Kuantan, that solving quadrilateral and triangle problems, students can only solve problems whose process is in accordance with the examples given without understanding the concept. Students also find it challenging to relate everyday problems to mathematical language. For example, students can solve quadrilaterals and triangles. The ability of students to convey ideas, ideas, or criticism is still low. This is indicated by students who have not been able to give arguments correctly and clearly about the questions they answered. In answering the quadrilateral and triangle problems, they have not used mathematical communication language that is easy to use, understand and understand. The learning model used is not varied. The teacher tends to lecture in conveying concepts, formulas, and how to use them. This causes students to get only abstract knowledge without knowing the real concept, so they do not see the application in everyday life.

Mathematical communication skills (mathematical communication) in learning mathematics need to be developed [6]. This is because, through communication, students can organize their mathematical thinking both orally and in writing. In learning mathematics in the classroom, communication of mathematical ideas can occur between teachers and students, between books and students, and between students and students. Through communication, mathematical concepts can be exploited in various perspectives such as students' thinking can be sharpened, understanding growth can be measured, students' thinking can be consolidated and organized mathematical knowledge, student problem development can be improved, and mathematical communication can be formed according to the level of education then the level of ability mathematical communication becomes diverse [7].

KKM is closely related to students' ability to read and understand the language of story questions, present in mathematical models, plan calculations from mathematical models, and complete calculations from non-routine questions [8]. Mathematical communication skills in learning mathematics need to be developed because through communication, students can organize their mathematical thinking both orally and in writing [9].

Communication is a very important part of mathematics. As expressed [10], communication is a way of sharing ideas and clarifying understanding. Through communication, ideas can be reflected, improved, discussed, and developed. The communication process also helps build meaning and preserve ideas, and the communication process can also explain concepts. When students are challenged about their thoughts and thinking skills about mathematics and communicate the results of their thoughts orally or in written form, they learn to explain and convince [11].

According to [10], there are at least two crucial reasons that make communication in mathematics learning the focus of attention, namely (1) mathematics as language; Mathematics is not just a thinking tool (a tool to aid thinking), a tool to find patterns, or solve problems, but mathematics is also an invaluable tool for communicating a variety of ideas, precisely, and succinctly, and (2) mathematics learning as social activities; as a social activity, in learning mathematics, the interaction between students, as well as teacher-student communication is an important part of "nurturing children's mathematical potential".

The indicators of mathematical communication skills measured in this study are: (1) explaining an idea or situation from an image or graphic in their own words in written form (writing); (2) express a situation with pictures or graphics (drawing); and (3) express a situation in the form of a mathematical model (a mathematical expression).

According to [9], teachers can accelerate the improvement of students' mathematical communication by giving math assignments in various variations. Mathematical communication will play an effective role if the teacher conditions students to listen actively. Therefore, the change in learning from teaching teachers to students learning must be the main focus in every mathematics learning activity.

One of the facts in the field was found that at SMP N 1 Teluk Kuantan, in solving quadrilateral and triangle problems, students were only able to solve problems whose process was the same as the example given by the teacher. Students also find it challenging to relate everyday problems to mathematical language. Social arithmetic is one of the mathematics subject matter that contains concrete and real things related to everyday life and problem-solving. Mastery of social arithmetic material is very important for students, but there are still many students who have learning difficulties [12].

The role of the teacher as the spearhead of success in implementing the curriculum plays a very important role in the achievement of the expected goals. In learning mathematics, a teacher must have extensive knowledge and create a learning atmosphere that is not monotonous and boring. They must also have a strong desire to develop students' thinking skills. In addition, the teacher also seeks to learn so that students can submit ideas, respond to ideas proposed by their friends and compare their opinions with those of other students.

Efforts to improve the learning process, preferably through the selection of appropriate and innovative learning models in mathematics learning [13]. The learning model that is thought to be able to improve the quality of the process and provide opportunities for students to develop mathematical communication skills through contextual matters is the Problem-Based Learning (PBL) model [14]. PBL or Problem-Based Learning is an approach to learning by making confrontations with students with practical problems. The PBL model has five phases of learning, namely: (1) student orientation to problems; (2) analyze the problem; (3) develop ideas or strategies; (4) investigation; and (5) evaluation.

PBL is based on the theory of cognitive psychology, especially based on Piaget and Vigotsky (Constructivism). According to [15], PBL can make students learn through efforts to solve real-world

problems (real word problems) in a structured way to construct student knowledge. Meanwhile, according to Duch in [16], PBL is a learning model that challenges students to learn how to learn and work in groups to find solutions to problems in the real world.

According to [10], the results of his research revealed that in the experimental class using the PBL model by providing real-world problems as a learning context by presenting real-world problems, students' curiosity was present. Hence, students were more interested in solving problems given by the teacher. Wardono, et al. in his research results that the process of mathematizing students with PBL learning that uses cards is better than the process of mathematizing students with scientific learning [17]. In his research, Wardono uses cards containing various problems for the learning materials he studies.

Problem-Based Learning is a learning approach by confronting students with practical problems in the form of ill-structured or open-ended stimuli in learning [6]. In addition, [4] also revealed that "Problem-Based Learning is a set of teaching models that uses problems as the focus for developing problem-solving skills, content, and regulation," which means Problem-Based Learning, is a learning model that uses problems as a focus to develop problem-solving skills, materials, and self-regulation. According to some of these expert opinions, Problem-Based Learning is suitable for classroom learning to improve or develop mathematical connection abilities and student learning independence. As stated by [4], the important purpose of Problem-Based Learning is to develop problem-solving skills and become independent students. Fitriani also conveyed the same thing about the purpose of the PBL model, namely developing investigative skills and problem-solving skills, skills to learn independently, and having behavior and social skills according to adult roles [4]. In addition, [18] said that "The goals of PBL include content learning, acquisition of process skills and problem-solving skills, and life-long learning". Meanwhile, [15] argues that the PBL model can improve critical thinking skills, foster initiative in studying or work, foster internal motivation to learn, and develop interpersonal relationships in group work. So, Problem-Based Learning that is applied in learning mathematics can facilitate students to develop their mathematical connection abilities and independent learning of students.

Before implementing Problem-Based Learning, teachers must know the characteristics of Problem-Based Learning first. The characteristics of Problem-Based Learning, according to [18], are as follows.

1. Problems become a starting point in learning;
2. The problems raised are problems that exist in the real world that are not structured;
3. Problems require multiple perspectives
4. Problems, challenging students' knowledge, attitudes, and competencies;
5. Learning self-direction becomes the main thing;
6. Utilization of diverse knowledge sources;
7. Learning is collaborative, communication, and cooperative;
8. Development of inquiry and problem-solving skills;
9. Process openness in PBM includes the synthesis and integration of a learning process;
10. PBM involves evaluating and reviewing student experiences and learning processes.

The characteristics of the PBL model are almost the same as [15], which states that the PBL model should meet the following characteristics: a) related to the real world; b) motivate students; c) requires decision making; d) multistage; e) designed for groups; f) presenting open-ended questions that trigger discussion; g) includes learning objectives, higher-order thinking, and other skills.

Knowledge and understanding of the characteristics of Problem-Based Learning the teacher can apply this learning correctly and accordingly. The implementation of Problem-Based Learning begins with giving problems first, as stated by [15] that Problem-Based Learning (PBL) is learning whose delivery is done by presenting a problem, asking questions, facilitating investigations, and opening dialogue. This is in line with Arends' opinion [4] that "The essence of Problem-Based Learning consists of presenting students with authentic and meaningful problem situations that can serve as springboards for investigation and inquiry". The same thing was also stated by [18] that "Problem-Based Learning (PBL) is an active-learning and learner-centered approach where unstructured problems are used as the starting point and anchor for the inquiry and learning process".

Thus, problem-based mathematics learning uses a real mathematical problem as a prefix in starting a lesson. Through a mathematical problem given at the beginning of learning, students are expected to be able to understand/find a mathematical concept from the problem-solving process given previously

With the initial knowledge possessed by students, students will be invited to be able to apply this initial knowledge to assist students in solving the problems given. A learning process in which a person's behavior will change through an exercise or experience by applying students' initial abilities to solve a problem [19] In PBL situations, students integrate knowledge and skills simultaneously and use them in relevant contexts, besides that PBL can improve critical thinking skills, foster student initiative in work, internal motivation to learn, and can develop interpersonal relationships in group work [17]. In the application of PBL, students must understand the concepts relevant to the problem that is the center of attention and gain learning experiences related to applying scientific methods in problem-solving and fostering critical thinking patterns. Understanding the appropriate concept of a problem is a learning process as proposed by [20] Learning is the process of interaction between students and their teachers and learning resources in a lesson.

Mathematics learning is an assistance provided by the teacher so that obtaining knowledge and knowledge, mastery of intelligence, and the formation of attitudes and beliefs in students towards learning mathematics can occur. Mathematics is part of science that is definite (exact), based on its origin, mathematics means knowledge obtained from the learning process so that mathematics is rational knowledge [20].

This PBL model causes motivation and curiosity to increase and changes in learning, especially in terms of the teacher's role [6]. With the application of PBL, teachers can increase students' curiosity about the material to be studied at that time. Students are more interested in learning because the problems given are related to everyday life that students often encounter. However, the application of PBL is not suitable to be applied to students who have low academic potential. This is in line with the opinion of [15], who said that the PBL model is appropriate to be used in creative classes and students who have high potential but are not suitable to be applied to students. Students who need tutorial guidance.

Nurbaiti, et al. argue that the PBL model can improve mathematical communication skills, foster initiative in learning or work, foster internal motivation to learn, and develop interpersonal relationships in group work [8]. Sugiyanto said that learning with the PBL model is a teaching approach that challenges students to solve real-world problems individually or in groups [1]. Fitriani stated that PBL can make students learn through efforts to solve real-world problems in a structured way to construct students' knowledge [4]. The process of mathematizing students with PBL learning using cards was better than the process of mathematizing students with scientific learning [8]. From the opinions of several experts above, it can be concluded that PBL is a learning model that begins with a real problem through a stimulus in learning. In connection with that, to overcome the problem of the low KKM, the researchers applied the PBL learning model.

The research carried out by the researchers above shows that learning mathematics begins with problems related to the real world and the importance of applying learning models that are in accordance with the material to be taught to improve students' mathematical communication skills.



## METHODS

This type of research is quantitative research with the quasi-experimental method. The study was conducted in an existing social setting, namely students in the classroom. The research unit is determined based on the learning group and school level. Learning is grouped into learning by applying the Problem-Based Learning (PBL) model and conventional learning. The school level is determined based on the ranking of the results of the National Mathematics Examination and chooses three schools, namely high, medium, and low-level schools. The treatment given will have an impact on Mathematical Communication Ability (KKM).

From each school, two classes were chosen, namely the experimental class and the control class. The experimental class received learning by applying the PBL model, while the control class received learning as the teacher had done. At high-level schools, there is a practical class 1 and a control class 1. At a medium level school, there is an experimental class 2 and a control class. This research is quasi-experimental research, with the design used pretest-posttest control group design. Briefly, the research design is presented in Table 1

Table 1. Research Design Pretest-Posttest Control Group Design

Group	Pretest	Treatment	Posttest
Eksperiment Class	O <sub>1A</sub>	X	O <sub>2A</sub>
Control Class	O <sub>1B</sub>	-	O <sub>2B</sub>

Information:

X : Application of Problem-Based Learning (PBL) model

O<sub>1A</sub> : Pretest experimental class

O<sub>2A</sub> : Posttest experimental class

O<sub>1B</sub> : Pretest control class

O<sub>2B</sub> : Posttest control class

The population in this study was all students of class VII SMP in the 2019/2020 school year, which consisted of 74 schools throughout the Kuantan Singingi Regency. To determine the research sample, the research population was grouped into three school levels, namely high, medium, and low levels, based on National Examination data for the 2017/2018 academic year, using intervals with the following criteria.

Table 2. Research Sample Criteria

School-level	Criteria
High	Mean UN $\geq \bar{X} + 0,5s$
Medium	$\bar{X} - 0,5s \leq \text{Mean UN} < \bar{X} + 0,5s$
Low	Mean UN $< \bar{X} - 0,5s$

Note: s = Standard Deviation

The researcher uses a probability sampling technique using random cluster sampling, taking samples based on groups or classes, not individuals. Researchers took one school from each junior high school level studied namely high school level, middle-level school, and low-level school. The determination of the school level is based on the achievements obtained in the National Examination in 2017/2018. Two sample classes were selected from each school. The researcher acted as a teacher in the experimental class, while the permanent teacher acted in the control class.

The average value of the National Examination for Middle School Mathematics students in Kuantan Singingi Regency 2017/2018 is 31.32, while the standard deviation obtained is 6.13. Based on the sampling stages, the samples obtained in this study were SMP Negeri 1 Teluk Kuantan for the high level, SMP Negeri 3 Teluk Kuantan for the medium level, and SMP Negeri 2 Benai for the low

level. In the experimental class, learning is carried out using the PBL model, while in the control class, learning is carried out as usual as the teacher's learning.

After knowing the school level, a purposive sampling technique was used to determine the research sample at each school level. With this technique, the samples in this study were SMP Negeri 1 Teluk Kuantan (high level), SMP Negeri 3 Teluk Kuantan (medium level) and SMP Negeri 2 Benai (low level). The class selection technique used as the experimental and control classes was also carried out using the purposive sampling technique.

The data of this study are quantitative data obtained through written tests, namely pretest data and posttest data. This description test was used to obtain data about the effect of the PBL model on students' mathematical communication skills.

The research instruments used in this study were learning tools and data collection instruments. Learning tools include the syllabus, Learning Implementation Plan (RPP), and Student Worksheets (LKPD). Data collection instruments include tests of mathematical communication skills.

Mathematical Communication Ability Test (KKM) is made based on indicators of mathematical communication skills. Each question that is made to see students' KKM must represent the indicators used in this study. The preparation of the KKM test on Social Arithmetic material begins with compiling a grid that contains Basic Competencies (KD), Competency Achievement Indicators (GPA), question indicators, grids for the KKM test. The questions to measure students' KKM are in the form of descriptions. KKM test scoring indicators and rubrics. The rubric scoring indicator is as follows.

Table 3 Scoring Rubric for Mathematical Communication Ability Test

Score	Written	Drawing	Mathematical Expression
0	There is no answer, even if there is, it only shows that you do not understand the concept, so that the information provided does not mean anything		
1	Only a little bit of explaining, right	Only a few of the pictures or graphics are correct.	Only a few of the mathematical models are correct
2	Explaining mathematically makes sense but is only partially complete and correct	Painting pictures or graphics but not complete and correct	Making a mathematical model correctly, but wrong in getting a solution
3	Explaining mathematically makes sense and is correct, even though it is not arranged logically or there are few language errors.	Painting pictures or graphics completely and correctly	.
4	Make a mathematical model correctly, then do the calculation or get the solution correctly		
	Maximum score 4	Maximum score 3	Maximum score 3

The data collection technique is an activity carried out to find data in the field that will answer the hypothesis in this study. In this study, the researcher gave a questionnaire (questionnaire) of students' learning motivation at the time of the study and gave test questions to students to measure Mathematical Communication Ability (KKM). In this study, only students' mathematical communication skills and learning motivation were considered based on the previously mentioned

indicators. The test used in this study was pretest conducted before learning and posttest conducted after learning. The pretest and posttest questions for the three control classes and the three experimental classes were also the same.

The data analysis technique begins with the pretest data normality test. If the pretest data is normally distributed, then test the research hypothesis using posttest data. If the data is not normal, test the research hypothesis using the difference between posttest data and pretest data. The data used to test the hypothesis were tested for prerequisites, namely normality, and homogeneity. After the prerequisite test has been carried out, the data is tested according to the needs of each hypothesis, namely using the t-test and one-way ANOVA test.

## RESULTS AND DISCUSSION

This study aims to state and analyze the application of the Problem-Based Learning (PBL) model to the Mathematical Communication Ability (KKM) of students in class VII SMP Negeri in Kuantan Singingi Regency on social arithmetic material. The data obtained from this study is the KKM data from the test results. To expand the discussion of the overall data analysis, the researchers analyzed the Student Worksheet (LKPD) and student answer sheets in the posttest.

Through this research obtained a number of data which include; (1) the results of the test scores of the KKM test questions in class 9.1 SMPN 1 Teluk Kuantan; (2) the results of the motivational questionnaire test scores; (3) the results of the pretest KKM assessment in the experimental class and control class, (4) the results of the pretest assessment of students' learning motivation in the experimental class and control class; (5) the results of the posttest KKM assessment in the experimental class and control class; (6) the results of the posttest assessment of students' learning motivation in the experimental class and the control class. The data presented are KKM data analysis with the PBL model in terms of all students, student learning motivation data analysis with the PBL model in terms of all students, KKM data analysis with PBL models in terms of high, medium, and low school levels, with the PBL model in terms of high, middle, and low school levels.

The researcher used a probability sampling technique by means of random cluster sampling, namely sampling based on groups or classes, not based on individuals. Researchers took one school from each junior high school level studied namely high school level, middle-level school, and low-level school. The determination of the school level is based on the achievements obtained in the National Examination in 2017/2018. Two sample classes were selected from each school. The researcher acted as a teacher in the experimental class, while the permanent teacher acted as a teacher in the control class. Then selection of the experimental class and the control class was chosen randomly from several homogeneous classes.

Based on the sampling considerations above, the steps in determining this sample are as follows.

1. Request a list of the names of SMP Negeri Kuantan Singingi ranked based on the average test scores of four subjects (Indonesian, English, Mathematics, and Science) for the 2017/2018 academic year to the Pekanbaru City Education Office. Ranking schools based on UN scores in Mathematics. It determined the school level category by using criteria that refer to the criteria used by Kadir (2010).
2. High school level: average UN score  $X + 0.5 SD$
3. Middle school level:  $X - 0.5 SD \leq$  average UN score  $< X + 0.5 SD$
4. Low-level school: average UN score  $< X - 0.5 SD$
5. Determining the Kuantan Singingi Regency Junior High School level based on the Mathematics National Examination score for the 2017/2018 school year by referring to the level category



above.

6. Choose one high-level school, one middle-level school, and one low-level school.
7. Choose two-class VII in each selected SMP, which is homogeneous.
8. Randomly determine the class that received learning using the Problem-Based Learning (PBL) learning model (experimental class) and the class that received conventional learning (control class).
9. The average value of the National Examination for Middle School Mathematics students in Kuantan Singingi Regency 2017/2018 is 31.32, while the standard deviation obtained is 6.13. Based on the sampling stages, the samples obtained in this study were SMP Negeri 1 Teluk Kuantan for the high level, SMP Negeri 3 Teluk Kuantan for the medium level, and SMP Negeri 2 Benai for the low level. In the experimental class, learning is carried out using the PBL model, while in the control class, learning is carried out as usual as the teacher's learning.

KKM test consists of pretest and posttest. The mathematics KKM pretest is given before the implementation of learning, while the posttest is given after the implementation of learning. Processing and analysis of pretest and posttest data aim to determine the increase in student learning outcomes before and after obtaining Problem-Based Learning (PBL) and conventional learning models in the experimental and control classes.

Based on the calculation results of the analysis of the effect of applying the Problem-Based Learning (PBL) model on mathematical communication skills in all students, it is presented in Table 4.

Table 4. Results of KKM Data Analysis Viewed from All Students

Class	N	Mean	t	Significance	Note
Experiment	78	80,9	11,433	0,000	Ho rejected
Control	78	79,1			

Table 4 above shows that Ho is rejected, meaning that there is an effect of PBL on the KKM of class VII students in terms of all students of State Junior High Schools in the Kuantan Singingi Regency. The results of calculations to analyze the effect of applying the Problem-Based Learning (PBL) model on mathematical communication skills in terms of high school level, medium-low are presented below.

Table 5. Results of KKM Data Analysis Viewed from School Level

School Level	Class	N	Mean	F	Sig	Ho
High	Experiment	30	78	0,319	0,002	Rejected
	Control	30	70			
Medium	Experiment	25	78	0,076	0,972	Accepted
	Control	23	69			
Low	Experiment	25	73	0,676	0,577	Accepted
	Control	23	67			

Table 5 shows that only at the high school level is there an effect of implementing PBL on KKM. The findings of this study are related to the indicators of mathematical communication ability (KKM) of class VII students before the implementation of the Problem-Based Learning (PBL) model, students still answer directly to problems without making mathematical models correctly, students also do not explain mathematically, and there are still language errors. Meanwhile, after applying the Problem-Based Learning (PBL) model, students are more focused on working on the given problems. Most of the students made mathematical models, explained them correctly, and did calculations or got the correct solution.

The research findings based on the results of data analysis concluded that the average value of mathematical communication skills of students who studied with the PBL model was better than

students who studied with conventional learning. Using the Problem-Based Learning (PBL) model, which begins with providing problems related to the real world, makes it easier for students to understand them. The stages in PBL learning are then guided to reanalyze the problems given. Then students are directed to make strategies or ideas to solve problems according to the KKM stages, thus learning is more meaningful because students can remember the concepts or formulas. They were used in solving problems in social arithmetic material. This can be seen that students are more thorough in completing each completion step in the LKPD. Students are also seen to transfer knowledge to each other and discuss problems related to the LKPD so that many students are correct in their answers. In this learning process, students are required to sit in groups to discuss with each other in solving the problems given. In groups, students ask each other students who are more familiar with the given problem. It means that there is good communication between students so that group discussions go well and students can be more independent in solving a problem.

This is relevant to the research conducted by [21], showing that learning mathematics with the Problem-Based Learning model is more effective than the expository learning model in terms of learning independence. The findings of the next study based on the results of data analysis showed that the average value of students' learning motivation who studied with the PBL learning model was better than students who studied with conventional learning. The learning process using the PBL model begins with giving students initial problems related to daily life problems. Students are more enthusiastic and enthusiastic in understanding problems. At the stage of the PBL model, students are required to find their mathematical concepts. This makes the learning process meaningful and makes students more enthusiastic about participating in learning activities. Students more easily understand mathematical concepts that will make them responsible for solving problems until they are finished in groups.

## CONCLUSIONS AND SUGGESTIONS

The conclusions obtained from this study are as follows.

1. There is an effect on applying Problem-Based Learning (PBL) KKM for class VII students in all SMP Negeri students in the Kuantan Singingi Regency.
2. There is an effect of applying Problem-Based Learning (PBL) on the KKM of seventh-grade high school students on Social Arithmetic material, but there is no effect on students at medium and low-level schools.

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