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The Effect of The LAPS-Heuristic Learning Model on Students' Problem Solving Abilities

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Abstract. The purpose of this research is In 21st century learning students are required to be more active in learning than teachers, therefore this study aims to determine whether there is an influence between the LAPS-Heuristic learning model and the ability to solve problems. Methodology: Using quantitative descriptive. Where, the number of samples in this study were 436 students from SMP 11 Jambi City who used purposive sampling technique. Data were then analyzed with the help of SPSS 21 application to find descriptive statistics in the form of mean, min, max, and category as well as inferential statistics using simple regression. Finding: The results obtained in this study are dominant both in the ability of student problem solving and the effectiveness of the LAPS-Heuristic learning model in mathematics lessons. With this, it is strengthened by the existence of a relationship and influence between the LAPS-Heuristic learning model and the students' problem solving abilities seen from the sig value below 0.025, which is 0.019 and has a contribution of 70.3%.

Keywords: Problem solving skill; Mathematics; LAPS-Heuristic Learning Model; Students

INTRODUCTION

Education is a human need because education contains a process of developing potential, including intelligence, skills and behavior, which are in accordance with the surrounding community (Astalini et al, 2019). This potential will then be used by humans to face problems in everyday life. In other words, education is expected to be able to shape human beings who have high intellectual and competency levels and have noble behavior to deal with problems in everyday life. This shows the importance of education in shaping humans who have high intellectual and proficiency levels, and have noble behavior (Pampaka et al, 2011; Asrial et al, 2019; Maison et al, 2019; Darmaji et al, 2020; Syahrial et al, 2020Astalini et al, 2020).

To be able to develop human potential must go through a process through education. In Indonesia, education is the right of every citizen, this is written in the 1945 Constitution of the

Republic of Indonesia article 31 paragraph 1.Every citizen can study at schools which are formal education providers, this is written in Law No.20 of 2003 concerning the National Education System. . The implementation of formal education in schools is manifested in learning activities from various subjects, one of which is mathematics.

Mathematics is a subject that students do not like and consider difficult even though mathematics has many applications in everyday life, for example in buying and selling activities. In buying and selling activities, mathematics plays a role in calculating profit, loss, price discounts and others. In social life, mathematics can also be found in calculating the population, the average birth rate of the population, and so on (Chen, Yang, & Hsiao, 2016; Bremholm & Skott, 2019). Likewise in the construction of a house, mathematics can be used in calculating the length of wood needed to make the roof frame of the house, so that the roof of the house is built strong. In other words, mathematics is closely related to the problem solving process in human life (Fägerstam, & Blom, 2013).

In the attachment to the Regulation of the Minister of National Education (Permendiknas) No.22 of 2006 regarding Content Standards, it is stated that one of the objectives of learning mathematics is that students have the ability to solve problems, which includes the ability to understand problems, design mathematical models, solve models, and interpret the solutions obtained (Scheiter et al, 2010; Peter, 2012; Bicer, Capraro & Capraro, 2013). In this goal, it has been shown that problem solving ability is one of the objectives of learning mathematics, but the reality in the field shows different things (Lazakidou & Retalis, 2010). According to the admission of a mathematics subject teacher at SMP Negeri 11 Jambi City, the ability to solve mathematical problems in grade 8 students of SMP Negeri 11 Jambi City is still low. This can be seen when students are unable to solve math problems, especially when the questions are presented in the form of story problems. Many students have difficulty understanding story problems, so that students find it difficult to determine the problem and its solution. In other words, the students had difficulty working on non-routine questions. This resulted in students' daily test scores below the minimum completeness. Based on this description, it can be concluded that problem solving ability is an important ability for students, but the reality in the field shows that the problem solving abilities of students have not developed optimally.

This low problem-solving ability can be caused by several factors, including teachers, students, environment and learning facilities and infrastructure (Alter, Brown, & Pyle, 2011; Bradshaw & Hazell, 2017; Özreçberoğlu, & Çağanağa, 2018). In this case, the teacher is one of the most competent factors and is the spearhead in the world of education, must be able to make various efforts and improve their abilities so that learning objectives can be achieved and the teacher acts as a facilitator to organize learning activities that make it easier for students to learn.

Based on the author's observations so far, the teaching and learning process at SMP Negeri 11 Jambi City tends to be teacher-centered. The teacher teaches using a direct learning model, this makes learning boring and uninteresting. At the time of learning only a small proportion of students are active, while other students seem lazy to take part in the learning process. In the end, students do not understand the material being taught. Meanwhile, the 2013 curriculum recommends student-centered learning. The 2013 curriculum encourages and prioritizes student activities to build understanding of knowledge, skills, spiritual and social attitudes in students in learning. To overcome this condition the teacher must be able to generate student participation and activity in learning, because student activities in class are very dependent on the learning model applied by the teacher. One of the teachers 'efforts to improve students' learning abilities is to use a good, precise learning model and present material with a learning model that is easily accepted by students (Hassan & Rahman, 2017; Kaya, Izgiol & Kesan 2017). With good learning management and supported by the right learning model it will cause positive reactions from students in the learning process so that it can increase students' abilities and motivation in learning. The right learning model can help teachers to stimulate student activity in learning so that learning objectives will be achieved.

One learning model that can be used and is expected to improve students' problem-solving abilities and learning motivation is the Logan Avenue Problem Solving (LAPS-Heuristic) learning model. The LAPS-Heuristic learning model is a series of questions that lead

to problem solutions. LAPS-Heuristik usually uses the question word what is the problem, is there an alternative, is it useful, what is the solution, and how best to do it (Anggrianto, Churiyah & Arief, 2016; Nuansyah, Efuansyah & Yanto, 2019). With this LAPS-Heuristic learning model students can generate curiosity and can also improve students' ability to solve various problems through a series of questions that will be asked by the teacher. Gitatenia et al (2020), explained that heuristics is a guide in the form of questions needed to solve problems. Heuristics serves to direct students to find solutions to a given problem.

LAPS-Heuristic will be more meaningful or even more innovative in learning if it is accompanied by a learning approach. Massey et al (2013) define the learning approach quite briefly, "An approach can be interpreted as a starting point or point of view towards the learning process." One type of learning approach is a scientific approach. Wieman (2014) explains that the scientific approach is intended to provide understanding to students in recognizing, understanding various materials using a scientific approach, that information can come from anywhere, anytime, it does not depend on direct information from the teacher. The scientific approach is the approach recommended by the government in learning in the 2013 Curriculum.

One of the materials in mathematics in junior high school that has links to other materials is the Pythagorean Theorem. This is because the Pythagorean Theorem is a prerequisite for other materials, such as tangents to circles. In addition, the Pythagorean Theorem also has applications in other materials, such as the concept of flat and space shapes. This means that students should understand the Pythagorean Theorem well in order to understand the material tangent to circles and work on problems related to the application of the Pythagorean Theorem related to shapes and shapes.

In 21st century learning, one of the abilities that must be possessed is the ability to solve problems. Therefore, the novelty of this research is seen froman innovation is needed so that students can have the ability to solve these problems. One of them is by applying the LAPS-Heuristic learning model (MPLH). Wahyuni (2015) explains that using the LAPS-Heuristic (MPLH) learning model can foster students' problem-solving abilities in mathematics. Therefore, the novelty of this research is with different areas, can the LAPS-Heuristic learning model (MPLH) be able to influence students' problem-solving abilities in mathematics.

Therefore, to address the research gap, the main objective of this study is to explore students' problem-solving abilities in mathematics and determine whether there is a significant impact in the application of the LAPS-Heuristic (MPLH) learning model.

METHOD

This research is a descriptive quantitative study using an associative approach (regression). This design aims to determine the influence between two or more variables that have an influence or not, measure the strength of the influence and make predictions based on the strength of this influence (Martens, 2010). Regression analysis is used to determine the influence of one or more independent variables on one dependent variable (Creswell, 2012).

This study used 463 grade VIII students at SMPN 11 Jambi City using purposive sampling technique. Purposive sampling is a sampling technique based on the criteria given by the researcher (Kerlinger, 2014), the criteria in this study were students of class VIII. The instruments in this study used tests and observations.

The instruments in this study used tests and observation sheets. Where, the test and observation sheets were developed by the researcher themselves, and were obtained for the essay test instrument with a total of 4 questions and had been validated by experts in their field and declared fit for use, and the reliability was 0.81, for the test score, each correct question was given. score of 25. Then the observation sheet after validation by the experts obtained 16 valid statements with a Cronbach alpha value of 0.75 using a Likert scale of 4, which is very inappropriate to have a score of 1, not according to having a score of 2, according to having Score 3 and very suitable to have a score of 4. Then to process the data used SPSS 21 application assistance which is intended to view descriptive data. Descriptive statistics are presented in summary frequencies, such as mean, mode, median, minimum, maximum and standard deviation (Cohen, Manion & Morrison, 2007). In this study, the descriptive statistics used are mean, min, max, and category.

Below is a category of the character of caring

for the environment of students, among others, very good, good, not good, and very not good, like table 1 below:

Table 1. Categories of Effectiveness of the LAPS-Heuristic (MPLH) learning model

Category	Interval	
	Laps-Heuristic Learning Model (MPLH)	Test
Very Not Good	16.0 – 28.0	0.0 – 25.0
Not Good	28.1 – 40.0	25.1 – 50.0
Good	40.1 – 52.0	50.1 – 75.0
Very Good	52.1 – 64.0	75.1 – 100.0

During data collection, the first activity that must be done is to select students based on the categories provided by the researcher, the observation sheet and test score is then processed using SPSS 21 application data to see descriptive statistics, in the form of, the mean , min, max, percentage, and category of students and see if there is an impact between the two variables.

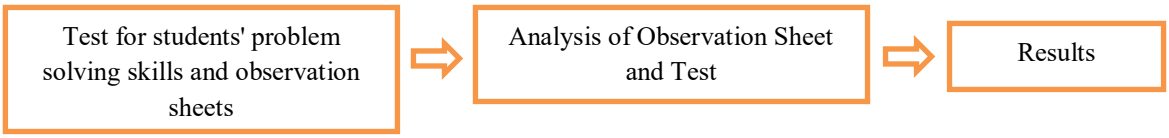

Figure 1. Data Collection

All data were obtained from tests conducted and observation sheets regarding the learning model LAPS-Heuristics (MPLH), all data collected and calculated which were assisted with the SPSS 21 application. Descriptive statistics are provided to calculate the frequency, percentage, average, min, and max sample (Cohen, Manion, & Morisson, 2007). In this study, quantitative data were analyzed using parametric statistics from simple regression to determine whether there was an impact between the LAPS-Heuristic learning model (MPLH) and students' problem solving abilities. This study uses SPSS 21 at a significance level of 0.025.

RESULTS AND DISCUSSION

Results

In 21st century learning, one of the abilities that must be possessed is the ability to solve problems. Therefore, an innovation is needed so that students can have the ability to solve these problems. One of them is by applying the LAPS-Heuristic learning model (MPLH). Wahyuni (2015) explains that using the LAPS-Heuristic (MPLH) learning model can foster students' problem-solving abilities in mathematics. Therefore, the novelty of this research is with different areas, can the LAPS-Heuristic learning model (MPLH) be able to influence students' problem-solving abilities in mathematics.

Problem solving skill. The results of the test given and the results obtained using the SPSS 21 application can be seen in the table 2.

From table 2, which came from 463 respondents from the junior high school in Jambi after they were obtained and the results obtained using the SPSS 21 application program, the students' problem solving ability in learning mathematics has a dominant result is good, with a percentage of 69.9 % for 327 students from a total of 463 students, very good at 20.7% for 96 students out of a total of 463 students, not good 7.1% for 33 students from a total of 463 students, and very bad at 1.5% for 7 students from a total of 463 students. From 463 students, the mean score was 68.5, the maximum score was 94, and the minimum score was 23.

The effectiveness of the LAPS-Heuristic (MPLH) learning model

The results of the test given and the results obtained using the SPSS 21 application can be seen in the table 3.

Table 2. The results of the test aimed at seeing the student's problem-solving abilities

Classification			Mean	Max	Mix	%
Range	**Category**	**Total**				
00.0 – 25.0	Not very good	7				1.5
25.1 – 50.0	Not good	33				7.1
50.1 – 75.0	Good	327	68.5	94	23	69.9
75.1 – 100.0	Very good	96				20.7
Total		463				100

Table 3. Results from the observation sheet to see the effectiveness of the LAPS-Heuristic learning model

Classification			Mean	Max	Mix	%
Range	**Category**	**Total**				
16.0 – 28.0	Not very good	19				4.1
28.1 – 40.0	Not good	48				10.4
40.1 – 52.0	Good	301	35.2	61	27	65.1
52.1 – 64.0	Very good	113				24.4
Total		**463**				**100**

From table 3, which came from 463 respondents from the junior high school in Jambi after they were obtained and the results obtained using the SPSS 21 application program, on the indicators of cooperation in the effectiveness of the LAPS-Hieuristic learning model in learning mathematics, the dominant results are good, with a percentage of 65.1% for 301 students from a total of 463 students, very good at 24.4% for 113 students from a total of 463 students, 10.4% for 48 students from a total of 463 students, and very bad at 4.1% for 19 students out of a total of 463 students. Of the 463 students, the mean score was 35.2, the maximum score was 61, and the minimum score was 27.

Influence. For the results of the influence of the LAPS-Heuristic (MPLH) learning model with students' problem solving abilities can be seen in table 4.

Table 4. The effect of the learning model on students' problem solving abilities

Variable	Unstandardized Coefficients		Standardized Coefficients	t	sig.
	B	Std. Error	Beta		
1 (Constant)	14.361	3.151		4.584	.000
Learning Model	.129	.124	.123	1.328	.019

From table 5, it can be seen the results of a simple regression test found that the regression equation is Y = 14.361 + 0.129X. for the number of contributions from the LAPS-Heuristic (MPLH) learning model on students' problem solving abilities can be seen in table 5 below.

Table 5. Contribution of the LAPS-Heuristic (MPLH) learning model on problem solving abilities

Model	R	R square	Adjust R Square	Std. Error of the Estimate
1	.813	.703	.702	2.703

Discussion

In 21st century learning, one of the abilities that must be possessed is the ability to solve problems. Therefore, an innovation is needed so that students can have the ability to solve these problems. One of them is by applying the LAPS-Heuristic learning model (MPLH). Wahyuni (2015) explains that using the LAPS-Heuristic (MPLH) learning model can foster students' problem-solving abilities in mathematics. Therefore, the novelty of this research is that with different areas, can the LAPS-Heuristic learning model (MPLH) be able to influence students' problem-solving abilities in mathematics.

Science learning in schools should prepare students to (1) be able to solve problems faced in everyday life by using the scientific concepts they have learned, (2) able to make appropriate decisions using scientific concepts, and (3) have a scientific attitude in solving problems encountered so as to enable them to think and act scientifically. To solve such learning problems efforts need to be made, among others, in the form of improvement in learning strategies, namely changing the learning model that can facilitate the occurrence of communication between students and teachers and students, so that they are able to foster students 'problem solving abilities (Fuchs et al, 2008; Xin et al, 2011).

According to Setiaji (2018) that teaching with discovery in addition to being related to discovery can also improve problem-solving abilities. Discovery learning model is a learning activity that maximally involves all students' abilities to search and find things (objects, people, or events) systematically, critically, logically, analytically so that they can formulate their own findings with confidence. According to Holford et al (2013), discovery learning is a type of learning where students build their own knowledge by conducting an experiment and discovering a principle from the results of the experiment. In discovery learning is generally more effectively used in science lessons. Because this learning model is able to help students meet two important criteria in active learning, namely understanding new information and integrating new information until the right knowledge is found (Saab et al, 2009; Mukhrejee et al, 2015).

This can be seen when at the first meeting there were still many students who were still unable to find existing problems and determine problem-solving plans, but at the next meeting most students were able to find and plan problem solving from the problems presented by the teacher. This is in accordance with the opinion of Rahman (2018), which states that one of the advantages of the LAPS-Heuristic model is that it is able to invite students to have problem solving procedures, be able to make analysis and synthesis and are required to make evaluations of the results of their solutions.

Students' mathematical problem solving abilities, especially occur at the problem solving stage, when students have succeeded in compiling a problem-solving plan, they are increasingly curious to carry out problem solving because they want to know the results of the efforts they have done before. The stage of carrying out this problem solving gets a percentage of 95% with a very good category, meaning that at this stage all students carry out activities to carry out problem solving according to the plan they have made. According to Rahman (2018), one of the advantages of the LAPS-Heuistic model is that it can generate curiosity and motivation to be creative.

During the learning process given by the teacher, there are several obstacles in which learning with the LAPS-Heuristic model is new for students so it is necessary to adjust the time and situation for students in the learning process. And group learning often takes up learning time, this could be because students are still not used to group learning so to overcome this problem the teacher asks students to sit in groups before learning begins. This is in accordance with the opinion of Nofrianto (2016), which states that one of the shortcomings of the LAPS-Heuristic model is that this model requires sufficient time to prepare for successful learning.

CONCLUSIONS AND SUGGESTIONS

Based on the results and the discussion that has been described, the dominant results obtained from both students' problem solving abilities and the LAPS-Heuristic learning model can be effective in mathematics lessons. Therefore, by using new learning innovations, one of which is using the LAPS-Heuristic

learning model, it can improve students' problem-solving abilities, where student solving abilities are one of the abilities students must have in 21st century learning. This is also supported by the relationship between the LAPS-Heuristic learning model with students' problem solving abilities in mathematics and there is an influence between the two variables with a contribution of 70.3%. According to the results, it is recommended that students need to be given the opportunity to do direct learning and teachers should carry out innovative learning.

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