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# THE EFFFECTIVENESS OF MISSOURI MATHEMATICS PROJECT LEARNING MODELS FOR IMPROVING STUDENTS' MATHEMATICAL CONNECTION ABILITY ON JUNIOR HIGH SCHOOL

Dini Apriani<sup>1</sup>, Harry Dwi Putra<sup>2</sup>, Heris Hendriana<sup>3</sup>

 <sup>1</sup>IKIP Siliwangi, Jl. Terusan Jend. Sudirman, Cimahi , Indonesia. <u>dinia8594@gmail.com</u>
 <sup>2</sup>IKIP Siliwangi, Jl. Terusan Jend. Sudirman, Cimahi , Indonesia. <u>harrydp@ikipsiliwangi.ac.id</u>
 <sup>3</sup>IKIP Siliwangi, Jl. Terusan Jend. Sudirman, Cimahi , Indonesia. herishen@ikipsiliwangi.ac.id

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#### ABSTRACT

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#### Keywords:

Mathematical Connection Ability Missouri Mathematics Project Junior High School Mathematical connection ability is one of the high level abilities but is still classified as low because students' understanding of the conceptual material given by the teacher, there are still students going through steps in working on the problems given, such as describing a symbol, in completing mathematical concepts, therefore This research aims to examine the effectiveness of using the Missouri Mathematics Project Learning Model carried out at MTs Ibnu Sina Jl. Tegal Overtime No. 105, Pamekaran, District. Soreang, Bandung Regency, West Java 4091, by taking a sample of 60 students consisting of control and experimental classes. The research method used in this action was the experimental method. Based on the results of descriptive analysis of students' mathematical ability data before being given treatment, it showed the highest score was 70, the lowest score was 55 and the average score was 61. Meanwhile, the results of descriptive analysis of students' mathematical ability data after being given The treatment showed the highest score of 70, the lowest score of 55 and the average score of 61. Those given the treatment showed the highest score of 87, the lowest score of 69, and the average score of 77.83. So the average mathematical connection ability of students after being given treatment is higher than the students' mathematical ability before being given treatment.

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#### Corresponding Author:

Dini Apriani, Department of Mathematics Education, Institut Keguruan dan Ilmu Pendidikan Siliwangi, Jl. Terusan Jend. Sudirman, Cimahi, Indonesia Email: <u>dinia8594@gmail.com</u>

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### **INTRODUCTION**

Mathematical connections are one of the important skills possessed by Indonesian students. The importance of mathematical connection skills can be seen in one of the objectives of learning mathematics in secondary schools, which is still used in most secondary schools in Indonesia (Siagian, 2016). The goal of learning mathematics is to understand mathematical concepts, explain the relationships between concepts, and apply concepts and algorithms flexibly, precisely, efficiently and accurately. Julaeha, (2020) states that mathematical connections include the following indicators: look for relationships between various representations of concepts and procedures; understand the relationships between mathematical topics; using deep mathematics other fields of study or daily life; understand equivalent representation same concept; looking for connections of one procedure to another procedure in equivalent representation; using connections between math topics and connections between mathematics topics and other topics. Meanwhile Syafar, (2020) said the importance of ability students' mathematical connections because mathematics is not a collection of branches or separate standards, mathematics is a field of study that integrated. Viewing mathematics as a whole raises the need for it studying and thinking about relationships within scientific disciplines mathematics. The usefulness of mathematics is not only limited to academic aspects whose nature lies only in the use of rigid formulas, however Furthermore, mathematics has a big role in the sciences other. To meet these needs of course standards are needed. Mathematics learning carried out at school is able to prepare participants quality education. Mathematical connections are one of the standards clearly what students must have. Based on several studies, this shows the importance of ability mathematical connection because it will help students to understand better concept, meaningfulness of the learning process, helping students complete the relationship between one concept and another concept or the relationship between something problems with mathematical concepts. Analogy of a problem with students can easily obtain it when students have mathematical connection skills Good. Thus, this mathematical connection ability will help students in compiling a mathematical demonstration of a problem posed or faced by students (Isnaeni, 2019).

Mathematical connections aim to help students in forming perceptions by seeing mathematics as an integrated part with the real world and know the benefits of mathematics both inside and outside school. However, in reality, many students lack mathematical connection abilities still low (Indriani & Sritresna, 2022). According to (Sudirman et al., 2017) Mathematical connections aim to make connections between concepts in mathematics plays a very important role in study mathematics. With knowledge Therefore, students understand mathematics more thoroughly and in more depth. Besides that, in memorizing is also getting less so learning mathematics becomes easier. Several studies suggest that students' mathematical connection abilities are still needs to be improved. Students are still experiencing problems in solving problems mathematical connection. However, the mathematical connection abilities of secondary school students in Indonesia are still relatively low. This can be seen from Indonesia's achievements in the Program for International Student Assessment (PISA) conducted by the OECD (Organization for Economic Co-operation and Development). The results of the 2012 PISA (Program for International Student Assessment) research stated that Indonesian students' achievement in mathematics was ranked 64th out of 65 countries participating in the study with an average score of 375, far below the average of 494. What's more Indonesian students' ability to solve level 5-6 questions is only 0.3, very far from the average of 12.6 (Martin, 2019).

Therefore, mathematics is important in everyday life, supporting many different types of activities that each individual will undertake, especially the ability to make mathematical connections (Habibi & Suparman, 2020). Why is it that mathematics is simply a subject that deepens and studies the relationship between attachment and key concepts, but if considered in the context of students' abilities, we say they are weak because they cannot do it, Okay solve simple problems stated in story questions as representing connections of an existing

concept (Amir, 2015). According to a mathematics teacher, students often struggle to understand mathematical concepts during the learning process, resulting in difficulties in applying mathematical concepts in their daily lives. This issue is evident when students attempt to solve practice problems assigned by the teacher, as many of them still encounter unsolved problems despite their best efforts. Based on observations, it is apparent that the researchers aim to change the negative mindset of students towards mathematics by promoting the connection between mathematical concepts and everyday life. This connection is not only relevant to daily life but also has a significant impact on an individual's critical thinking abilities,

Students can connect mathematical concepts, their understanding of mathematics will become more profound and lasting. Currently, mathematics is often taught as a collection of disconnected mathematical discussions, which can make it difficult for students to recognize the underlying general principles. As a result, students may struggle to remember formulas and concepts and fail to appreciate the broader mathematical connections that underlie these ideas. To connect one material conception to another, scholars must understand the generalities used in a problem presented (Masjava & Wardono, 2018). Understanding is meant when scholars can make connections between new knowledge and preliminarily acquired knowledge in particular on occasion material. When scholars have difficulty understanding alsoscholars will have difficulty connecting the generalities used to help resolve the problems presented. The criteria for pupil difficulties are grounded on Kutz's opinion1991), and (Permatasari & Nuraeni, 2021) videlicet (1) Difficulty in connections between generalities,(2) Difficulty connecting between symbols and symbols,(3) Difficulty connecting between images and symbols,(4) Difficulty connecting between contextual stories, images and symbols. In addition, difficulties in using introductory generalities will increase scholars' difficulties in literacy and using the principles. This means not learning the generalities or principles causes scholars to witness obstacles in literacy. For relating pupil difficulties can be seen from the miscalculations they make ascholars do when answering questions.

This shows students' mathematical connection abilities Indonesia is still relatively low. Especially in the application of certain material concepts to other material and the application of mathematical material to other fields of science. Whereas according to Hayati et al., (2018), students cannot apply concepts that have been studied previously with the concepts learned next. So in this case, students have difficulty understanding question. Several studies show the low ability of students' mathematical connections which includes aspects of mathematical connections. An example is the link between concepts between systems Linear Equations in Two Variables (SPLDV) with material Linear Equations in Two Variables (PLSV), algebraic operations, One Variable Linear Equations (PLSV), and straight line Equations. If students If you are able to relate these mathematical ideas, your understanding of mathematics will increase deep and long-lasting because they are able to see the connection between mathematical topics and topics in other fields and everyday life Meanwhile, according to Aida, (2017), indicators used to analyze mathematical connection abilities class VIII junior high school students are as follows: (1) find relationships from various representations about mathematical concepts and procedures. (2) understand the relationship between topics in mathematics. (3) able to use mathematics in solving problems in everyday life. (4) understand equivalent concept representations. (5) find the relationship between procedures one with others that are equivalent. (6) using connections between mathematics and mathematics alone or with other knowledge. All existing problems can be looked for alternative ways by designing learning models well. According to Ramlan (2014) a learning model is a method or technique presentation that teachers use in the learning process to

achieve objectives learning. Models or methods play a very important role in learning, because through selecting the right model or method can direct teachers to quality effective learning. In teaching, appropriate methods are needed produce effective learning (Rosyadi, 2016). According to Good, Grouws, and Ebmeire (Noviyanti, 2014), defines the Missouri Mathematics Project (MMP) as a program designed to assist teachers in terms of effective use exercises so that students achieve extraordinary improvements. According to Jaswandi, (2023) Missouri Mathematics Project (MMP) is a learning model that structured to assist teachers in the use of exercises for students achieve improvement because students are given the opportunity and freedom to think both groups and individuals and so that students are able to apply understanding yourself by working independently in seatwork. The Missouri Mathematics Project (MMP) learning model is a model learning that is found empirically through research, and consists of several steps, namely daily review, development, controlled practice/cooperative learning, practice independence, and assignments (Wahyuni & Efuansyah, 2018) According to (Gunadi et al., 2020), the Missouri Mathematics Project (MMP) learning model requires activity students in learning because the teacher is only a facilitator who accompanies and only helps students discover their knowledge Characteristics of the model Missouri Mathematics Project (MMP) learning is a project assignment sheet (student worksheet), where there is a project assignment It is hoped that it will be able to improve mathematics learning outcomes and thinking abilities students' creativity which can be done by completing the project effectively individual or group. Based on some of the descriptions above, the author is interested in doing this research on "The Effectiveness Of The Missouri Mathematics Project Learning In Improving The Mathematical Connection Abilities Of Class VIII Students"

### METHOD

This research was conducted at one of the schools, namely MTs Ibnu Sina Jl. Overtime Tegal No. 105, Pamekaran, Kec. Soreang, Bandung Regency, West Java 4091, by taking a sample of 30 experimental class students and 30 control class students. The research method used in this action is the experimental method, to be a measuring tool for mathematical connection abilities, the researcher prepared instrument questions according to the characteristics and the syntax for mathematical connection capabilities is as follows; a) Look for relationships between various representations of concepts and procedures, and understand relationships between mathematics topics b) Understand equivalent representations of the same concept, looking for relationships between various representations of concepts and procedures in equivalent representation c) Looking for relationships between warious representations of concepts and between mathematics topics and other topics e) Using mathematics in other fields of study or everyday life. Analysis techniques used in this research are:

- 1. Data Description Testing, namely Calculation of mean, median, mode, standard deviation and others.
- 2. Data Analysis Requirements Testing namely normality testing and data homogeneity.

3. Data Hypothesis Testing, namely with the Mean Difference Test.

 $H_0$  : There is no influence of the Missouri Mathematics Project learning model on mathematical connection abilities  $\label{eq:harden}$ 

 $\mathrm{H}_1$  : There is an influence of the Missouri Mathematics Project learning model on mathematical connection abilities

### **RESULTS AND DISCUSSION**

### Results

This research aims to The Effectiveness Of The Missouri Mathematics Project Learning In Improving The Mathematical Connection Abilities Of Class Viii Students by following the model syntax MMP learning, namely review, development, controlled practice, independent work, and giving assignments/homework, this is in accordance with the five stages in the MMP learning model stated by Sadiq (2009:102). The research results that we got are: as follows: Student activity data in implementing the Missouri Mathematics Project learning model obtained by using student activity observation sheets. Data from student observations during the four meetings can be seen in the following table:

Descriptive Statistics								
	N Range Minimum Maximum Mean Std. Deviation Va							
PretestKontrol	30	6,00	49,00	55,00	51,5333	2,23966	5,016	
PretestEksperimen	30	15,00	55,00	70,00	61,7667	4,97361	24,737	
PostestKontrol	30	12,00	51,00	63,00	57,4000	4,18206	17,490	
PostestEksperimen	30	18,00	69,00	87,00	77,8333	5,65126	31,937	
Valid N (listwise)	30							

Table.1 Descr	iption of Ex	perimental and	Control	<b>Class Data</b>

Based on the data table, the results of descriptive statistics can be seen from various aspects, including those presented in the table of results from the pretest and posttest for each control and experimental class. From the experimental class we can examine the pretest score which got a minimum score of 55 and a maximum score of 70 by getting an average score. 61.76, while the posttest score got a minimum score of 69 and a maximum score of 87, while the average score was 77.83. This can be seen as an understanding that there is quite a significant change. Meanwhile, if you observe the control class, the minimum score was 49 and the maximum was 55. with an average score of 51.53, while the posttest got a minimum score of 63 with an average of 57.40, there are clearly visible differences. from the experimental class and the control class. From the comparison above it can be It was concluded that the experimental class students' mathematical connection abilities shows a higher positive influence than the control class. This is meaningful there is an influence of giving a model learning Missouri Mathematics Project (MMP) against capabilities Mathematical connections in class experiment.

**Table.2 Data Normality Test Results** 

Class	N	Lo	Ltabel	Conclusion
Eksperimen	30	153	,71	Normality
Control	30	,164	,39	Normality

From the calculation results for the experimental class, the value obtained is  $L_o = 0.153$ , while from the Liliefors table for a = 0.05 and obtained  $L_{table} = 0.71$ , then the value  $L_o < L_{table}$  means H0 is accepted and it can be concluded that the experimental class data is normally distributed. And the calculation results for the control class, obtained a value of  $L_o = 0.164$ , while from the Liliefors table for a = 0.05 and obtained  $L_{tabel} = 039$ , then the value of  $L_o < L_{tabel}$  means H0 is accepted and it can be concluded that the control class data is normally distributed. From the data above, it can be seen that  $L_o$  in both classes is less than  $L_{table}$ , so it can be concluded that the sample data for both groups is normally distributed. Next, a test is carried out homogeneity of variance of the two populations using Fisher's test. This homogeneity test was carried out for find out whether both variances originate from a homogeneous population.

 Class	Ν	Varians (S <sup>2</sup> )	$F_{\rm Hitung}$	Ftabel	Conclusion	
 Eksperimen	30	31,93	1 014	2 12	Accent H <sub>2</sub>	
Control	30	17,49	1,017	2,12	1000pt 110	

 Table. 3 Data Homogenity Test Result

From the calculation results, the value  $F_{count} = 1.014$  and  $F_{table} = 2.12$  at a significance level of  $\alpha = 0.05$  with degrees of freedom in the numerator 24 and degrees of freedom in the denominator 24. So  $F_{count} < F_{table}$  (1.014 < 2.12) means that H<sub>0</sub> is accepted so it can be concluded that both groups have homogeneous variance

Table.4 T-Test Result							
Class	Ν	Mean	$F_{\rm Hitung}$	Ftabel	Conclusion		
Eksperimen	30	57,4	3,56	1,679	Reject H <sub>o</sub>		
Control	30	87,7					

From the table above it can be seen that toount greater than ttable (3.56 > 1.679) then it can be concluded that H<sub>0</sub> is rejected and H<sub>1</sub> accepted with a significance level of 5%. Thus the average ability Conection mathematical thinking of student groups given the Missouri learning model Mathematics Project (MMP) is higher significantly from the average ability mathematical connections of student groups given a learning model conventional or in other words providing the Missouri learning model Mathematics Project (MMP) has influence in improving abilities

## Discussions

Before carrying out the learning process in class, it must be done first instrument testing for indicators of mathematical connection ability class VIII students on SPLDV material. Instrument trial participants There are 27 class IX students. The pre-test was carried out with The aim is to determine students' initial abilities regarding mathematical connections before learning is carried out with SPLDV material. Question The pre-test used is in the form of a description consisting of five questions. The learning used in this action uses appropriate steps. According to Handayani, (2018) Missouri learning model The mathematics project has five steps, namely:

a. Review

Learning begins with remembering the material previously related to the material to be discussed, namely SPLDV. Material previously it was a prerequisite for working on the questions new. Providing motivation at the beginning of learning can be arouse students' enthusiasm for carrying out activities learn to solve practice questions. Providing motivation This is done by opening students' insight into the importance of SPLDV teaching material in life.

b. Development

The development stage is the learning stage for develop previous material in order to obtain material new. Learning is carried out through a process of explanation and discussion. In the explanation process, students acquire new material used in the process of discussing practice questions.

### c. Controlled exercise

Students are presented with a required project sheet completed in groups. Project worksheet regarding a series of questions based on the material that students have obtained at the previous stage. Teachers monitor and guide group activities to avoid conceptual errors or misconception

d. Seatwork

After students do group activities completing a series of questions, then students develop the material by completing practice questions regularly independent or individual. Students apply or apply material that has been understood from the explanation and discussion process group.

e. Home work

At the final stage of learning, students make a summary material he has obtained from various activities. Besides that, students are given a project assignment sheet to work on House.

If you look at the stages carried out by researchers, this can make learning structured and systematic in learning SPLDV material. The success of this research is possible in the MMP learning model this is learning becomes more effective because students are invited play an active role in learning according to (Sulfemi & Desmiati, 2018) Project-based learning and involving group communication can increase student enthusiasm in the classroom, so that students can be encouraged to prefer learning mathematics which is classified as difficult to understand. in line according to (Rahman & Nasryah, 2020) there are modelsstudents are given MMP learning opportunity and freedom to think in groups solve that problem given by the teacher in connection with learning materials . Besides that Students become enthusiastic when doing assignments in a group way. In groups Students must play an active and creative role find solutions to problems. Each other interact with fellow members and teachers, with each other exchange ideas, resulting in insight and their experience increases Apart from that, students are also given guidance and individual questions so that students become more proficient in them solve math story problems. As the research progressed, several Students are asked to come to the front of the class take turns doing play activities role. Every time students play roles The teacher writes down the numbers according to the facts on the blackboard. According to (Marliani, 2016) student creativity can emerge and develop through thinking skills which is divergent, that is, can resolve mathematical problems through various methods procedural by looking at the other side of the math problem This is what causes all students to play an active role in the classroom in learning mathematics whose concepts have been mastered through MMP learning. Then by using theory of solving story problems, students are guided by teachers to determine the things that are known inside question, then determine what is being asked, then create a mathematical model correctly, and finally do the calculations. Here section interprets model answers to the original problem was eliminated. At stage In this learning the students looked enthusiastic and everyone wants to go to the front of the class to role playing. However, not all students asked to come to the front of the class remembering the restrictions the time you have. In terms of student activity, a very clear change between the control class and the experimental class is the students' passive habits during learning and students' lack of courage in expressing opinions orally or appear to speak and carry out SPLDV mathematics learning activities. Judging from students' mathematical connection abilities, the research results show that there is differences in students' mathematical connection abilities before being treated with abilities students' mathematics after being given treatment. Based on the results of descriptive analysis of ability data Students' mathematics before being given treatment showed the highest score of 70, the lowest score of 55 and the average score is 61. Meanwhile, the results of the descriptive analysis of mathematical ability data students after being given treatment showed the highest score of 87, the lowest score of 69 and the average score of 77.83. So the average student's mathematical connection ability after being given treatment is higher compared to students' mathematical abilities before being given treatment.

# CONCLUSION

Based on the research results obtained using the t test, researchers can conclude that there is influence of the Missouri learning model Mathematics Project (MMP) towards mathematical connection abilities students on the subject of SPLDV. Missouri learning model delivery Mathematics Project (MMP) is one way to improve students' mathematical connection abilities, . Success Students in learning cannot be separated from teacher's ability to convey subject matter. Model selection Proper teaching must be accompanied by teachers' abilities and efforts to improve students' mathematical cognitive abilities.

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