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The Effect of PBL Model and Learning Motivation on the Mathematical Connection Ability of Class VIII MTs Darussalam Batumarta Students

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Abstract

Students in the eighth grade during the second half of the 2022–2023 school year were the focus of this research, which examines how the project-based learning (PBL) model and students' intrinsic motivation to learn affected their capacity to make mathematical connections. There was a quantitative approach to this research. Methods such as observation, interviews, documentation, surveys, and testing are used to gather data. This study used a quasi-experimental design. Because the individuals already existed before to the research, subject selection was not random. Using the total sampling approach, 66 students, representing the whole eighth grade, were selected as the population. Both tests and non-tests are used in the data collecting technique. Research consists of many stages, such as planning, execution, and data processing. Data analysis approaches involve quantitative data analysis and data quality assessment. Based on the results of research and discussion, it is known that 1) there are differences in the mathematical connection ability of students who obtain PBL model learning with students who obtain conventional model learning; 2) there is a difference in the increase in the mathematical connection ability of students who obtain PBL model learning with students who obtain conventional model learning; 3) there are differences in the mathematical connection ability of students who obtain PBL model learning with students who obtain conventional model learning on strong learning motivation; 4) there are differences in the mathematical connection ability of students who obtain PBL model learning with students who obtain conventional model learning on weak learning motivation; 5) there is an interaction between the use of learning methods and student learning motivation on the ability to solve thematic connection problems; and 6) there is a significant influence or interaction between the use of PBL models and the level of learning motivation on mathematical connection ability.

***Keywords**: PBL, Learning Motivation, Student Mathematical Connection*

Introduction

Learning mathematics can be meaningful and impactful for students through the teacher's creativity to get around the current curriculum, teacher innovation in learning, and linking teaching material with events or events in real everyday life. Hendriana & Soemarno stated that the basic mathematics concepts contain data identification and Problem solving [1]. Mathematics requires identifying problems that may occur from existing facts and how to solve problems. Students are expected to have the ability to identify existing facts and find ways to solve problems that require higher thinking skills.

Our country must maintain its focus on developing and improving its human resources if it is to remain competitive on a global scale [2]. Curriculum revisions, new learning models and methodologies, an improved evaluation system, and other similar endeavors may all contribute to a higher standard of education. To increase student learning outcomes, it is necessary to design learning methodologies and models. This will allow schools to implement learning activities that are focused on student activity [3], [4]. All classroom activities should revolve on the students, and they are expected to actively participate in their own learning.

The Problem with scientific learning in schools is the weak implementation of learning that can develop students' thinking skills. One way that can be done so that students become active in learning is to change the learning paradigm that considers the teacher as the main role in learning to be changed to students as the center of learning. In contrast, the teacher is only a guide, motivator, and facilitator and no longer a learning center [5]. Therefore, it is necessary to improve students' ability and activeness in learning mathematics so that, in the end, it can improve student learning outcomes.

The problem-based learning (PBL) approach to education places an emphasis on students' problem-solving skills, encouraging them to think critically, formulate hypotheses, and ultimately develop and implement their own solutions [6]. Students' cognitive, emotional, and psychomotor skills may all be enhanced using the problem-based learning (PBL) paradigm [7]. During instructional and learning activities, students are provided with many chances to methodically address difficulties by exchanging ideas with one another. In the problem-based learning (PBL) paradigm, students are asked to apply their critical thinking abilities to real-world situations in order to discover suitable solutions.

The existence of learning media in the delivery of material in the classroom will increase students' interest in learning [8]. Based on reality, students' interest in mathematics is still relatively low. Mathematics is still considered a boring and difficult-to-understand subject. Almost all mathematics material is difficult to understand, including mathematical connections in the form of mathematical problems. Grade VIII MTs Darussalam Batumarta students also feel this Problem. They are not interested in learning problems that have something to do with mathematical connections because of incomprehension in finding problem solutions.

In terms of learning, students will succeed if they are willing to learn. This desire or drive is called motivation. Motivation is the mental drive that moves and directs the attitude and individual actors in learning. In motivation, there are ideals or aspirations of students. With these ideals or aspirations, it is hoped that students can learn and understand the goal in learning and realize self-actualization. With students' abilities, proficiency, and skills in mastering subjects, they are expected to be able to apply and develop learning creativity. The higher the motivation to learn, the more the learning achievement will increase. Conversely, the lower the learning motivation, the more the learning achievement will decrease.

Motivation is a factor that affects the quality of learning and the use of appropriate learning strategies. Students who are motivated more easily develop the ability to think to find a problem solution, especially related to mathematical connection skills. Humans become creative when motivated, and one may be more creative after concretizing a common and formative idea [9]. Learning motivation is also needed to improve mathematical thinking skills. The ability to think mathematics is not just memorizing several facts; it requires encouragement from oneself and others to make a comprehensive and integrated attitude change through knowledge and skills [10].

Sari argues that there are two axes to the capacity to establish mathematical connections: first, between mathematical concepts; and second, between mathematics and the actual world or other areas of mathematics education outside of the classroom [11]**.** A talent that incorporates mathematical ideas or establishes links between mathematical design and other parts of daily life is the capacity to establish mathematical connections. Students benefit more from connections because they help them better grasp how mathematical ideas relate to other scientific topics.

Teachers and students alike may benefit from developing mathematical connection skills by actively seeking out examples of mathematics in context, whether that be in students' everyday lives, in their hobbies, or in the relationships between different mathematical topics or other areas of study. Learning to communicate, reasoning, solving problems, associating concepts, and developing a good attitude towards mathematics are the five facets that make up mathematical talents [12].

These mathematical skills include the ability to associate mathematical ideas called mathematical connections. This means that this skill is presented in basic competencies that explain if students are required to have the expertise to relate mathematics modules to one another. This is one indicator of the ability to make mathematical connections.

One way that can be done so that students become active in learning is to change the learning paradigm that considers the teacher as the main role in learning to be changed to students as the center of learning. In contrast, the teacher is only a guide, motivator, and facilitator and no longer a learning center [13]–[15]. Therefore, it is necessary to improve students' ability and activeness in learning mathematics so that, in the end, it can improve student learning outcomes.

Facts based on the results of observations in the field about the ability of mathematical connections are relatively low. Before conducting research, observations were made on 32 students related to mathematical connection abilities. There were 8 students (25%) who could answer mathematical connection questions while 24 students (75%) could not answer the questions. Facts in the field show that the ability to think at a higher level has not been the main focus of teachers; the low ability to make mathematical connections is thought to be caused by the fact that the learning provided is still teacher-centered. The teacher always explains all the material, gives examples of questions, gives assignments that students must complete, and then the teacher gives an assessment. This kind of learning is called conventional learning.

The mathematical connection ability of students, in general, is still very low because many students cannot use all the information from the Problem and have not been able to make mathematical models, so the answers obtained are sometimes irrelevant. A teacher must learn a lot and continue to learn following the development and world of increasingly advanced and rapid learners.

The findings of the observational study lead researchers to believe that the teacher-centered nature of the instruction is to blame for pupils' poor mathematical connection abilities. The instructor presents the whole course, goes over each concept, gives out sample questions and answers, and gives out tests. This method of education will thereafter be referred to as traditional education. Everyone goes through this, even the students of MTs Darussalam Batumarta VI. To get around these issues, we need a learning model that makes maths interesting and enjoyable rather than intimidating. This will help students become more engaged in the material, which in turn will boost their enthusiasm in learning and make it simpler for them to develop their mathematical connection abilities. Learning models with interactive features provide real-world situations that call for creative problem-solving abilities. One approach to overcoming problems with students' mathematical connection-making abilities is the problem-based learning paradigm, more often known as PBL. For the purpose of adapting to novel and suitable situations, this learning model employs many forms of intelligence to tackle real-world problems.

Method

A quantitative technique was used in this investigation. In quantitative research, which is grounded in positivism, specific populations or samples are studied, data is collected using research tools, and hypotheses are tested by quantitative statistical analysis [16]. Statistical evidence is the basis of quantitative data gathering methods, which include observing, interviewing, documenting, surveying, and measuring procedures via tests [17].

The current research employs a quantitative technique to quantify the impact of problem-based learning and learning motivation on mathematical connection skills, taking into account the indicated background and problem design. Learning motivation and the problem-based learning (PBL) paradigm will guide the therapy. An experimental class using the problem-based learning methodology constitutes the first learning group. Meanwhile, in a more traditional approach to learning, the second group is referred to as the control class. Based on the amount of student motivation, each group will be separated into two categories: highly motivated students and weakly motivated students.

Quantitative data analysis, data quality testing, validity testing, reliability testing, average difference testing, and Anova Two Lanes are the data analysis methodologies used in the research. The motivation category is based on the results of learning motivation data based on mathematical connection ability. The criteria for grouping learning motivation consist of two categories, namely the strong category with a value of $\geq$ 65% ideal score and the weak group with $\leq$ 65% or a score of $\leq$ 98 with an ideal score or a maximum of 150.$\geq$ 98.

Results and Discussion

Description of the object of study

The purpose of this research is to find out how eighth graders at MTs Darussalam's problem-based learning approach and intrinsic desire for learning affect their capacity to make mathematical connections. The experimental group in this research employed a problem-based learning (PBL) methodology, whereas the control group received more traditional instruction. This research was carried out at MTs Darussalam, which was carried out approximately 6 times in each class with material on mathematical connections concerning relations and functions. Before learning is carried out, both classes are given a pretest. After completing all the material, both classes are given a final test (post-test) to see the students' abilities after learning.

This research yields both quantitative and qualitative data. Students' mathematical connection skills, as well as their pre- and post-test scores, provide quantitative data. At the same time, the learning motivation questionnaire provided qualitative information. We use SPSS software, version 21, for Windows, to process the data.

Hypotheses were tested by comparing the growth in mathematical connection ability of students in the experimental class with those in the control class, using test result data. An analysis of the data's normality and homogeneity will be conducted on the experimental and control classes before the study hypothesis is tested. The student's mathematical connection test yielded the data that would be analysed. The following is a breakdown of the two assessments that measure mathematical connection ability: the pretest and the posttest.

Table 1. *Descriptive Statistics*

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Pre_Eks	33	20	80	38.79	17.095
Pre_Kontrol	33	10	60	26.52	15.025
Post_EKs	33	40	100	73.48	17.161
Post_Kontrol	33	35	85	58.64	12.137
Valid N (listwise)	33				

The results show that there were 33 students in the control group and 33 in the experimental group, as shown in the table above. The experimental group had a higher average pretest score (38.79) than the control group (26.52), indicating that the experimental group performed better on average.

Description of Data Pretes and Postes Mathematical Connections

1. **Mathematical Connection Pretest Data**

The purpose of analysing this pretest data was to determine if the experimental and control groups were equivalent in their starting ability. The following table displays the pretest findings of mathematical linkages for students in both the experimental and control classes:

Table 2. *Description of Statistical Scores Pretest Mathematical Connection Capabilities*

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Pre_Eks	33	20	80	38.79	17.095
Pre_Kontrol	33	10	60	26.52	15.025
Valid N (listwise)	33				

The experimental class had an average pretest score of 38.79, according to the data in the table above. The control class's average pretest score was 26.52, which suggests that the experimental class performed better on average than the control class. In addition, we used a normalcy test to see whether the experimental and control classes' pretest results were representative of a normally distributed population. In this research, the test is to accept H0 if the significance value is more than 0.05 and to reject H0 if the significance value is less than 0.05. Here are the experimental findings, calculated using Windows-based SPSS programme version 21.

Table 3. *Test Results Normality Test ScoresMathematical Connection Capabilities*

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pretest Eksperimen	.199	33	.002	.889	33	.003
Pretest Kontrol	.183	33	.007	.863	33	.001

a. Lilliefors Significance Correction

The significant values of the pretest for the experimental group were 0.003, whereas for the control group they were 0.001, as seen in the table above. If the result is less than 0.05 (0.003), then the null hypothesis (H0) is rejected, indicating that the experimental class's test scores follow an atypical distribution. Because the significance value is less than 0.05 (0.003), the null hypothesis (H0) is rejected, indicating that the control class's pretest score follows an atypical distribution. So, first, we check for mathematical links in the abnormally distributed normality test, and then we use the Mann-Whitney U test to further investigate. To find out whether the two samples are similar or different before the test, the Mann-Whitney U test is used.

The results of the pretest and the posttest follow an abnormal distribution, therefore we use the Mann-Whitney U test to compare them. In this research, the test is to accept H0 if the significance value is more than 0.05 and to reject H0 if the significance value is less than 0.05.

The Mann-Whitney U-test yielded a significance level of 0.004 (two-tailed). H0 is rejected due to the significance value being less than 0.05. This means that the two groups' pretest results are different. The capacity of pupils to make mathematical connections in the beginning is different in order to take pretest results. The experimental group has a greater maximum value of 80 compared to the control group's maximum value of 60 when looking at it from this perspective. Nevertheless, in order to see improvements, the pretest is examined from the average or mean of every class. This is based on the fact that the control group averaged 26.52 and the experimental group 38.79. Students in the experimental group outperformed those in the control group on the arithmetic pretest.

2. Data Postes Mathematical Connections

Using these post-test results, researchers were able to compare the experimental and control groups' starting skills. The following table displays the results of the mathematical connection post-test for students in both the experimental and control classes:

Table 4. *Description of Statistical Score Postes Mathematical Connection Capabilities*

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Post_EKs	33	40	100	73.48	17.161
Post_Kontrol	33	35	85	58.64	12.137
Valid N (listwise)	33				

Table 4 shows that the average posttest score for the experimental group is 73.48. On the other hand, when compared to the control class's average posttest of 58.64, the experimental class's average posttest seems to be superior. Nonetheless, it is not possible to infer any difference in ultimate ability between the control and experimental groups based on these data. After that, we ran a normalcy test to check whether the post-test results from the experimental group and the control group followed a normal distribution. whether they did, we could then compare the two groups.

In this research, the test is to accept H0 if the significance value is more than 0.05 and to reject H0 if the significance value is less than 0.05. Here are the experimental findings, calculated using Windows-based SPSS programme version 21. As seen in the table below:

Table 5. *Postes Score Normality Test Results Mathematical Connection Ability*

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Post_EKs	.144	33	.080	.929	33	.032
Post_Kontrol	.152	33	.050	.965	33	.366

a. Lilliefors Significance Correction

Table 5 shows that the significant values for the control group were 0.366 and for the experimental group they were 0.032. The null hypothesis (H0) is rejected when the p-value for the experimental class is less than 0.05, indicating that the positive values follow an atypical distribution. Since the significance level is less than 0.05 (0.366), we may reject the null hypothesis (H0). This indicates that the control class's positive value follows a normal distribution. If the results of the abnormally distributed normalcy test show mathematical relationships, we may go on to the Mann-Whitney U test.

The results of the pretest and the posttest follow an abnormal distribution, therefore we use the Mann-Whitney U test to compare them. In this research, the test is to accept H0 if the significance value is more than 0.05 and to reject H0 if the significance value is less than 0.05. Mann-Witney test findings indicate a significance value of 0.000 (2-tailed). We reject the null hypothesis (H0) if the significance level is less than 0.05. This indicates that the post-test scores of the two groups are distinct. It follows that students with mathematical connection ability who encounter fundamental learning challenges do worse on post-tests than those who encounter conventional learning. In comparison to the control group, which has a maximum value of 85, the experimental group has a higher maximum value of 100. But we want to see an improvement in the post-test average or mean for each class.

In light of the fact that the control group averaged 58.64 and the experimental group 73.48. The results show that compared to traditional learning models, the fundamental learning issue learning model improves students' mathematical connection skills.

Gain Score Analysis

We looked at the gain index data to evaluate how much each class improved students' ability to make mathematical connections. The following table displays the results of statistical analyses performed on the gain index data from both the experimental and control classes:

Table 6. *Description of Mathematical Connection Capability Gain Score Statistics*

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
N_Gain Eksperimen	33	.000	1.000	.59288	.284353
N_Gain Kontrol	33	.167	.667	.43626	.132700
Valid N (listwise)	33				

In the experimental group, the mean or average gain index was 0.59, whereas in the control group, it was 0.43; this difference suggests that the control group performed better on average. The gain index data from the control and experimental groups are compared using the normality test to see whether they follow a normal or non-normal distribution. In this research, a significance value greater than 0.05 is used to accept H0 as the null hypothesis, whereas a value less than 0.05 is used to reject it. In the table below, you can see the outcomes of the normalcy test:

Table 7. *Normality Test Score Gain Index Mathematical Connection Capability*

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Class	Statistic	df	Sig.	Statistic	df	Sig.
N_Gain_Persen	Experiment	.111	33	.200*	.930	33	.036
	Kovensional	.200	33	.002	.946	33	.103

The significant value of the experimental class gain index of 0.036 < 0.5 was achieved and H0 is rejected according to the data in the table above. This indicates that there is something wrong with the distribution of the experimental class's gain index. Students that study using the PBL paradigm have an unusually scattered gain index of mathematical connection skills. Since the control class gain index's significance value is 0.103 > 0.5, we may accept H0 and say that the control class gain index follows a normal distribution. The anomalous distribution of the gain index of mathematical connection ability may be inferred from the fact that one of the gain indices is also aberrant. The next step was to run the Mann-Whitney-U test. In order to test for the rise, the authors used Mann-Whitney U since one of the gain index values had an atypical distribution. In this research, the test is to accept H0 if the significance value is more than 0.05 and to reject H0 if the significance value is less than 0.05. In the table below, you can see the Mann-Whitney test results:

Table 8. *Mann Whitney-U Test Results Gain Index Mathematical Connection Capability*

Test Statistics

	N_Gain_Score
Mann-Whitney U	319.500
Wilcoxon W	880.500
Z	-2.903
Asymp. Sig. (2-tailed)	.004

The above table makes it clear that the null hypothesis (H0) is rejected when the two-tailed value (0.004) is less than the significance level (0.05). We may thus infer that students whose education is guided by the Problem Basic Learning model experience a distinct improvement in their mathematical connection ability compared to students whose education is guided by the traditional approach.

The results of the normalcy test and the Mann Whitney-U Gain Index test indicate that students who adhere to the Problem Basic Learning model experience a greater improvement in their mathematical connection ability compared to students who adhere to the conventional learning model.

Analysis of Differences in Mathematical Connections in Strong and Weak Learning Motivation

We looked at data on students' mathematics connection skill on high and poor motivation abilities to determine whether there were any changes. By combining traditional learning models with the Problem-Based Learning paradigm. The following table contains the findings of statistical descriptions of data on high and weak learning motivation:

Table 9. *Description of Strong and Weak Learning Motivation Statistics*

Descriptives

Motivasi Belajar

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Kuat	34	106.24	9.503	1.630	102.92	109.55
Lemah	32	89.31	2.546	.450	88.39	90.23
Total	66	98.03	11.026	1.357	95.32	100.74

Based on the table above, information was obtained that the *mean* or average of strong learning motivation in the experimental class and control class was 106.24, while for the weak learning motivation group of the experimental class and control class, it was 89.31. The following results from a description of mathematical connection capabilities in terms of strong and weak learning motivation are seen in the following table.

Table 10. *Description of the Ability of Mathematical Connections Punched from Strong and Weak Learning Motivation*

Dependent Variable:Koneksi Matematis

Learning Motivation	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Strong	74.479	2.034	70.414	78.544
Weak	57.529	2.097	53.338	61.720

Based on the table above, information was obtained that *the mean* or average mathematical connection to learning motivation is strong at 74.48. In contrast, the learning motivation group is weak for mathematical connections at 57.53. Then, the mathematical connection capabilities reviewed from the experimental and control learning models are shown in the following table.

Table 11. *Description of Mathematical Connection Capabilities Punched from Learning Model*

Dependent Variable:Koneksi Matematis

Learning Model	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Eksperimen	73.842	2.061	69.721	77.963
Konvensional	58.167	2.069	54.031	62.303

Based on the table above, information was obtained that *the mean* or average mathematical connection in the experimental class learning model was

73.84, while the mathematical connection in the conventional classroom learning model was 58.17.

Mathematical connections to learning motivation are strong

The purpose of this data analysis was to compare the abilities of the Problem Basic Learning learning model with more traditional learning models in terms of their capacity to establish mathematical connections that lead to significant learning motivation. Here, we use the Single Path Anova test for our investigation. The following table displays the outcomes of a mathematical connection ability description in terms of high learning desire.

Table 12. *The results of the description of mathematical connection ability in terms of strong learning motivation*

Descriptive Statistics

	N	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Experiment	16	60.00	100.00	85.6250	3.47236	13.88944
Control	18	40.00	85.00	69.1667	2.59619	11.01470
Valid N (listwise)	16					

Based on the table above, information was obtained that the *experimental class's mean or average strong learning motivation* was 85.63, while for the control class, the strong learning motivation group was 69.17. Next, a normality test will be carried out

Table 13. *Normality Test*

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Mathematical Connection	.123	34	.200*	.946	34	.095

The data for mathematical connections' final scores in courses using the Problem Basic Learning learning model and traditional learning models with normal distribution are strongly motivated, as shown in the table above (sig 0.095 > 0.05). Then, a homogeneity test was carried out for the variance of the final sample score of mathematical connections based on strong motivation. The following homogeneity test results of mathematical connection scores using the *Levene test* are presented in the following table.

Test of Homogeneity of Variances

Mathematical Connection

Levene Statistic	df1	df2	Sig.
2.345	1	32	.136

According to the data in the table, the distribution of mathematical connection abilities is normally distributed, as the obtained significance level of 0.136 is more than 0.05. After then, use a one-track Anova to see whether there is a difference in the means of the two groups. If the significance level (sig) is greater than α = 0.05, then the null hypothesis (H0) is accepted; otherwise, it is rejected. The appendix to the thesis presents the complete findings of the calculation of the mathematical connection exam for pupils. Comparison of two groups of students' average mathematical connections, one taught using the Problem Basic Learning approach and the other using more traditional methods, with respect to the category of students' learning motivation in the strong group.

Table 14. *Anova Results: One Path of Mathematical Connection Based on Strong Learning Motivation*

ANOVA

Mathematical Connection

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2294.485	1	2294.485	14.814	.001
Within Groups	4956.250	32	154.883		
Total	7250.735	33			

The data in the table show that the probability value is less than 0.05 (0.001), which means that we can reject the null hypothesis (H0). Alternatively, we can say that students' mathematical connection ability differs between the Problem Basic Learning learning model and traditional classes based on Strong group motivation.

Based on the table above, what was the obtained significance? More than 0.05 indicates that the ability of mathematical connections is homogeneously distributed. Next, test the mean difference for the two groups using a single-track Anova. The test criteria are as follows: if the probability value (sig)

Mathematical connections to learning motivation are weak

Data analysis on mathematical connection ability and learning motivation was conducted to see the difference between mathematical connection ability and weak learning motivation using the *Problem Basic Learning* and conventional learning models. This analysis uses the Single Path Anova test. The following results from a description of mathematical connection ability in terms of high learning motivation are seen in the following table.

Table 15. *The results of the description of mathematical connection ability in terms of high learning motivation*

Descriptive Statistics

	N	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Experiment Connection	17	40.00	90.00	62.0588	2.67954	11.04802
Connection Control	15	35.00	80.00	53.0000	2.87849	11.14835
Valid N (listwise)	15					

Based on the table above, information was obtained that *the mean* or average learning motivation was weak using the *Problem Basic Learning* learning model of 62.06 and weak learning motivation in the conventional learning model of 53. Next, a normality test will be carried out in the table below:

Table 16. *Normality Test*

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Weak Motivational Mathematical Connection	.125	32	.200*	.963	32	.321

In both the Problem Basic Learning and traditional learning models, the final score data of mathematical connections based on weak motivation follows a normal distribution, as seen in the table above (sig 0.321 > 0.05).

The last step in determining the mathematical connection score based on low motivation was to conduct a homogeneity test to determine the sample variance. The table above shows that the skill of mathematical connections is homogeneously distributed, since the significance level of 0.738 is more than 0.05. After then, use a one-track Anova to see whether there is a difference in the means of the two groups. If the significance level (sig) is greater than α = 0.05, then the null hypothesis (H0) is accepted; otherwise, it is rejected. The appendix to the thesis presents the complete findings of the calculation of the mathematical connection exam for pupils.

Using the Problem Basic Learning model and more traditional methods of instruction, we compared the average mathematical connections made by students in two groups: one with little motivation and the other with higher motivation.

With a probability value of 0.027, which is less than 0.05, we may reject H0.

Alternatively, we can infer that students' mathematical connection skill differs between traditional learning courses and those that use the Problem Basic Learning learning model. Examining the Relationship Between Learning and the Motivation of Students to Learn

We looked at post-test data on students' mathematical connection abilities to see how the learning model interacted with their intrinsic willingness to study. The two-track Anova results indicate that the model is valid, or there is an influence of all independent variables pertaining to the learning model, student learning motivation, and the interaction between the two. This is supported by a Corrected Model sig value of 0.000 < 0.05. Next, because the learning model's sig value is less than 0.05 (0.000), it indicates that the learning model has an impact on the mathematical connection values. Likewise, a GIS on learning motivation of 0.000 < 0.05 indicates that mathematical connection ability is impacted by student learning desire. In addition, the results of the GIS on the learning model and learning motivation show that there is a substantial impact or interaction between the two on mathematical connections, with a p-value of 0.027 < 0.05.

The two-track Anova test found that students' capacity to make mathematical connections is affected by both their learning model and their drive to study.

Discussion

Differences in Mathematical Connection Capabilities

Based on the initial test processing (pretest) results in the experimental and control classes, average scores of 38.79 and 26.52 were obtained. Furthermore, further tests were carried out to determine whether or not the students' initial mathematical connection abilities were the same in each class. Information obtained on the maximum score of the experimental class pretest was 80, while the maximum score of the control class was 60. The minimum score of the experimental class is spread out at 20, and the control class is 10. Based on the normality test results, the score data is not normally distributed. So, the average difference test was carried out using the Mann-Whitney test, concluding that the two classes have unequal mathematical connection abilities.

From the description of the calculation results, it is known that the average achievement score of mathematical connection ability posts in the experimental and control classes showed quite different results. The average obtained in the experimental class using the Problem-Based Learning (PBL) model was 73.48, while in the control class using the conventional model was 58.64. The average ability of mathematical connections in the experimental class is higher than that of the mathematical connections of the control class. This shows that there are significant differences in mathematical connection capabilities in the experimental class and the control class. This difference in mathematical connection ability is due to differences in learning activities and atmosphere in the experimental and control classes.

To see the quality of the improvement in the mathematical connection ability of students from both groups can be seen from the main index. Based on the normality test of mathematical connection gain data, it was obtained that the mathematical connection gain distribution was abnormal, with a sig value of 0.036 < 0.05 for the experimental class gain score and a sig of 0.004 < 0.05 for the gain score of the control class, which means that there is a difference in the increase in mathematical connections of students who obtained the Problem Basic Learning learning model with students who acquire conventional learning. The results of processing the students' mathematical connection gain index data illustrate that the increase in mathematical connection ability of experimental class students is better than that of control class students. In other words, increasing students' mathematical connection ability with learning the Basic Learning Problem model is better than conventional learning.

Mathematical Connections Based on Strong and Weak Learning Motivation

This study's formulation of the problem examines how students who use the Basic Learning Problem learning model and those who use traditional learning based on strong and weak learning approaches differ in their mathematical connections.

In the past, normality was examined to ascertain whether or not the mathematical connection data of the students in the two courses, based on their levels of learning motivation—strong and weak—was regularly distributed. According to the Shapiro-Wilk normality test, the data is normally distributed with sig. 0.095 > 0.05 and sig. 0.321 > 0.05. Moreover, statistical levene tests were used to perform homogeneity testing. Significance is obtained by analysing the homogeneity test findings. Homogeneous is indicated by sig. 0.738 > 0.05 and 0.136 > 0.05.

Subsequently, one data line of mathematical connections between the two classes was used to conduct the average difference test based on the strong learning motivation group. ANOVA test findings showed that sig was obtained. 0.001 < 0.05 means a difference in the average mathematical connection between students who obtain basic learning problem learning models and those who obtain conventional model learning. Furthermore, based on the weak learning motivation group, an average difference test was conducted using ANOVA one data line mathematical connection between the two classes. Based on the results of the ANOVA test, sig was obtained. 0.027 < 0.05 means the average mathematical connection between students who obtain *basic learning problem* learning models and students who obtain conventional model learning.

Questionnaires are given after learning to see students' attitudes more specifically. Analysis is carried out on the statement of each aspect and indicators for aspects of knowledge about him. One indicator is to know one's strengths, weaknesses, interests, and talents. Students generally receive mathematics learning well using the *problem-based learning* (PBL) learning model. *O*nly a small number of students who doubt and have negative attitudes towards mathematics learning use the *problem-based learning* (PBL) learning model.

The Interaction Between the Use of Learning Methods and Student Learning Motivation on the Ability to Solve Mathematical Connection Problems

In order to apply Project Based Learning (PjBL), children must be at the centre of the learning process in order to delve deeper into the information they have learnt [19]. This study's final problem formulation examines the relationship between learning motivation and the use of the Problem-Based Learning (PBL) paradigm on the capacity for mathematical connections. Students that receive the Problem-Based Learning (PBL) model have a higher mathematical connection skill, as indicated by the two-way ANOVA test findings, where the learning model's sig value was 0.000 < 0.05. A learning motivation score of 0.000 < 0.05 indicates a relationship between the strong motivation group and the poor motivation group in terms of mathematical connection skills.

The results of the two-way Anova hypothesis test indicate that there is an interaction between the level of learning motivation and the use of the Problem-Based Learning (PBL) model on the ability to make mathematical connections. A Sig value of 0.027 < 0.05 was obtained in the learning method*learning motivation.

The findings of this study were consistent with pertinent prior research, supporting the findings of earlier studies like Aisyah (2019), which found that students taught using conventional strategies and those taught problem-based learning strategies differed in their capacity to solve larger story problems.

Additional research findings bolster this study, such as Ihwatun's discovery that students receiving problem-based learning have a greater gain in mathematical connection ability than students receiving conventional learning [20]. The results of Tresnawati's research on the problem-based learning model can improve the ability to think critically and increase students' self-efficiency as well as products resulting from the application of the effectiveness of the problem-based learning model in learning activities [21].

Conclusion

The following conclusions can be made in light of the research findings and discussion of the variations in mathematical connection abilities that occur in the Problem-Based Learning (PBL) learning model and traditional learning models with the degree of learning motivation: 1) Significance values are derived from the average difference in mathematical connection scores using the Mann Whitney test. H0 is rejected when 0.000 is less than 0.05. In other words, students who get basic learning (PBL) model learning and students who receive conventional model learning differ in their capacity for mathematical connection.

2) The sig value is discovered. based on the findings of the Mann-Whitney test for the mathematical connection gain score difference. H0 is rejected when 0.004 is less than 0.05. In other words, students who learn the problem-based learning (PBL) learning model exhibit a distinct increase in their mathematics connection skill as compared to students who receive standard model learning. The experimental class's average gain score is higher than the control class's based on the average gain score.

3) The ANOVA test findings showed that one line obtained sig. 0.001 0.05, indicating a difference in the mathematical connection ability between students who receive conventional model learning and those who receive basic learning (PBL) model learning on strong learning desire.

4) The ANOVA test findings show that there is a difference in the mathematical connection ability between students who receive basic learning (PBL) model learning and students who receive conventional model learning on weak learning motivation. One line obtained sig. 0.027 0.05 indicates this.

5) The application of instructional strategies and student motivation have an impact on students' capacity to resolve thematic connection issues. according to the sig value of the Anova Two Line test findings. A learning motivation of 0.027 < 0.05 in learning model * indicates a significant influence or interaction between the degree of learning motivation and the use of the Problem-Based Learning (PBL) model on the capacity to make mathematical connections.

Bibliography

[1] H. Hendriana and U. Soemarno, *Penilaian pembelajaran matematika*. Bandung: PT Refika Aditama, 2019.

[2] Ibrahim, N. N. Cahyani, M. Astuti, and Febriyanti, “Implementasi Manajemen Kelas dan Relevansinya

dengan Hasil Belajar Siswa di Madrasah Ibtidaiyah Qur'aniah 8 Palembang," *J. Hikmah*, vol. 18, no. 2, pp. 187–199, 2021.

[3] Maryance, M. Guntur, Andrias, Z. Hayati, and A. Alfiyanto, "Penerapan Metode Demonstrasi Dalam Meningkatkan Motivasi Belajar Anak Terhadap Pelajaran PAI Di Kelurahan 12 Ulu Palembang," *J. Pendidik. dan Konseling*, vol. 4, no. 3, pp. 26–29, 2022.

[4] Y. Susanti, M. Guntur, R. Jaya, R. Rais, A. Alfiyanto, and F. Hidayati, "Pengorganisasian Kelas dalam Pembelajaran Daring Masa Pandemi di MI," *At-Tafkir*, vol. 15, no. 1, pp. 82–97, 2022, doi: 10.32505/at.v15i1.4352.

[5] M. D. Putri and D. Rusdiana, "Improving Scientific Argumentation Skills of Junior High School Students In Science Learning By Employing Phenomenon-Based Learning With Video …,"*… 3rd Int. Conf. Adv. …*, 2017, [Online]. Available: https://www.academia.edu/download/94439484/180.pdf

[6] A. Novianti, A. Bentri, and A. Zikri, "Pengaruh Penerapan Model Problem Based Learning (Pbl) Terhadap Aktivitas Dan Hasil Belajar Siswa Pada Pembelajaran Tematik Terpadu Di Sekolah Dasar," *J. Basicedu*, vol. 4, no. 1, pp. 194–202, 2020, doi: 10.31004/basicedu.v4i1.323.

[7] A. A. Afif, Fitri Hidayati, Ivan Riyadi, and Mail Hilian Batin, "Implementation of Active Learning-Based Arabic Learning at Muhammadiyah 5 Palembang Senior High School," *Al-Hijr J. Adulearn World*, 2022, doi: 10.55849/alhijr.v1i3.9.

[8] I. Mangdalena, A. Fatakhatus Shodikoh, and A. R. Pebrianti, "Pentingnya Media Pembelajaran Untuk Meningkatkan Minat Belajar Siswa Sdn Meruya Selatan 06 Pagi," *Ed. J. Edukasi dan Sains*, vol. 3, no. 2, pp. 312–325, 2021.

[9] S. Abramovich, "Teaching Mathematics through Concept Motivation and Action Learning," *Educ. Res. Int.*, vol. 2019, 2019, doi: 10.1155/2019/3745406.

[10] A. Alfiyanto, "UPAYA MENINGKATKAN KEMAMPUAN KOGNITIF ANAK MENGENAL ANGKA DI PAUD KASIH IBU," *J. Migasian*, 2020, doi: 10.36601/jurnal-migasian.v4i1.98.

[11] V. Sari, "The students' mathematical critical and creative thinking ability in double-loop problem solving learning," *Journal of Physics: Conference Series*, vol. 1315, no. 1. 2019. doi: 10.1088/1742-6596/1315/1/012024.

[12] V. R. Hidayati, "System of Linear Equation Problem Solving: Descriptive-Study about Students' Mathematical Connection Ability," *Journal of Physics: Conference Series*, vol. 1594, no. 1. 2020. doi: 10.1088/1742-6596/1594/1/012042.

[13] A. Alfiyanto and F. Hidayati, "Tenaga Pendidik dan Literasi Digital: Tantangan Pembelajaran Di Era Industri 4.0," *Ikhtisar J. Pengetah. Islam*, 2022, [Online]. Available: http://ojs.iaisumbar.ac.id/index.php/ikhtisar/article/view/45

[14] A. Alfiyanto, I. Riyadi, and F. Hidayati, "Komunikasi Interpersonal Kepala Sekolah dalam Meningkatkan Motivasi Kerja Guru di SMP Negeri 23 Palembang," *Semin. Nas. Pendidik. Jur. Tarb. Ftik Iain Palangka Raya*, vol. 1, no. 1, pp. 29–40, 2021.

[15] A. Alfiyanto, "Manajemen Rekrutmen Tenaga Pendidik Baru di SMA Nurul Palembang," *Adaara J.*

Manaj. Pendidik. Islam, 2022, [Online]. Available: https://jurnal.iain-bone.ac.id/index.php/adara/article/view/1741

[16] Sugiyono, *Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R & D*. Alfabeta, 2014.

[17] S. Annur, *Metodologi Penelitian Pendidikan*. Palembang: Noerfikri, 2018.

[18] N. Sudjana and Ibrahim, *Penelitian dan Penilaian Pendidikan (Kedelapan)*. 2014.

[19] I. K. Sukmana and N. Amalia, "Pengaruh Model Pembelajaran Project Based Learning terhadap Peningkatan Motivasi Belajar dan Kerja Sama Siswa dan Orang Tua di Era Pandemi," *Edukatif J. Ilmu Pendidik.*, vol. 3, no. 5, pp. 3163–3172, 2021, doi: 10.31004/edukatif.v3i5.1068.

[20] H. Ihwatun, "Peningkatan kemampuan koneksi matematis melalui pembelajaran berbasis masalah pada kelas IV Al Hakim Kecamatan Batu Aji Kota Batam," Universitas Terbuka, 2018.

[21] R. Tresnawati, "Problem based learning terhadap kemampuan berfikir kritis dan self efficacy siswa sekolah dasar," Universitas Terbuka, 2018.