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Differences in Problem Solving Ability and Confidence of Students Who Get Learning Using PBL and GI Models

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Abstract

This study aims to determine: (1) statistically test and analyze the problem-solving abilities of students taught by the Problem Based Learning model or not higher than students taught by the Group Investigation learning model; (2) statistically testing and analyzing the self-confidence of students who are taught by the Problem Based Learning model are higher or not than students who are taught by the Group Investigation learning model; (3) the interaction between learning models (PBL and GI) with early mathematical abilities (KAM) on students' problem-solving abilities; (4) the interaction between learning models (PBL and GI) with early mathematical abilities (KAM) on students' self-confidence abilities. This research is quasi-experimental. The population in this study consisted of all students of class X MA Ponpes Darul Quran totaling 210 students in the 2021/2022 academic year, taking samples of two classes totaling 70 students using the cluster random sampling technique. Data analysis was performed using a two-way analysis of variance (ANOVA). The results of this study indicate that: (1) The problem-solving abilities of students who are taught problem-based learning are higher than students who are taught by group investigation, and (2) the Self-Confidence of students who are taught problem-based learning is higher than students who are taught by group investigation. , (3) there is no interaction between the learning model and KAM on students' problem-solving abilities, and (4) there is no interaction between the learning model and KAM on students' self-confidence abilities.

Keywords: Problem Solving, Self Confidence, Problem Based Learning Model, Group Investigation Model, KAM

Abstrak

Penelitian ini bertujuan untuk mengetahui: (1) menguji secara statistic dan menganalisis kemampuan pemecahan masalah siswa yang diajar dengan model pembelajaran *Problem Based Learning* lebih tinggi atau tidak daripada siswa yang diajar dengan model pembelajaran *Group Investigation;* (2) menguji secara statistic dan menganalisis kemampuan *self-confidence* siswa yang diajar dengan model pembelajaran *Problem Based Learning* lebih tinggi atau tidak daripada siswa yang diajar dengan model pembelajaran *Group Investigation*; (3) interaksi antara model pembelajaran (PBL dan GI) dengan kemampuan awal matematis (KAM) terhadap kemampuan pemecahan masalah siswa; (4) interaksi antara model pembelajaran (PBL dan GI) dengan kemampuan awal matematis (KAM) terhadap kemampuan *self-confidence* siswa. Penelitian ini merupakan penelitian quasi eksperimen. Populasi dalam penelitian ini terdiri dari seluruh siswa kelas X MA Ponpes Darul Quran yang berjumlah 210 siswa Tahun Pelajaran 2021/2022, mengambil sampel dua kelas berjumlah 70 siswa dengan menggunakan teknik *cluster random sampling*. Analisis data dilakukan dengan analisis varians (ANAVA) dua jalur. Hasil penelitian ini menunjukkan bahwa: (1) Kemampuan pemecahan masalah siswa yang diajar pembelajaran problem based learning lebih tinggi dibanding siswa yang diajarkan dengan group investigation, (2) *Self Confidence* siswa yang diajar pembelajaran problem based learning lebih tinggi dibanding siswa yang diajarkan dengan group investigation, (3) tidak terdapat interaksi antara model pembelajaran dan KAM terhadap kemampuan pemecahan masalah siswa, (4) tidak terdapat interaksi antara model pembelajaran dan KAM terhadap kemampuan *self-confidence* siswa.

Kata kunci: Pemecahan Masalah, Kepercayaan Diri, *Problem Based Learning*, Model Group Investigation, KAM

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INTRODUCTION

Since mathematics is a science based on abstract concepts, the presentation of mathematical material in learning is frequently associated with everyday life to allow students to find concepts and

develop maths skills based on prior experience or knowledge. Students are said to be problem solvers when they can examine a problem and pertain their knowledge in new situations. Given this, it is important to study mathematics not only to know but also to understand and apply it to other problems. As a result, education is expected to provide the students with the opportunity to apply their knowledge in everyday life.

According to Baroody (Sofiyah et al., n.d.), "mathematics plays an important role in developing the mind, solving problems and challenges that emerge in the progress of science and technology, and trying to serve as a problem-solving tool." According to Manullang and Rajagukguk, the purpose of learning mathematics is to prepare students for change to face challenges. Students can apply for changes through training and acting based on thinking logically, rationally, critically, carefully, honestly, efficiently, and effectively (Manullang & Rajagukguk, 2016).

In line with what is said by Magdalena and Surya, problem-solving is an important part of the curriculum in the mathematics learning process because it allows students to gain experience by applying the knowledge and skills they already have when solving problems that arise. unusual, pattern recognition, generalization, and mathematical communication that can be improved (Magdalena & Surya, n.d., p. 1169).

In addition to cognitive abilities such as problem-solving abilities which are the topics in this study, students also need to have good affective abilities, one of which is self-confidence. Self-confidence is an important aspect of life because it fosters activity and creativity, allowing people to achieve their goals. Individuals who already have a high level of self-confidence will see it as something that can be controlled and controlled (Leny Hartati & Farah Indrawati, 2019, p. 54).

According to Sardin and Nurmita, self-confidence is a personal factor that plays an important role in human life. Personality is yet another factor contributing to achieving objectives. The ability to solve problems is also related to students' self-confidence. Because one of the problems required confidence to solve. Students who believe in their abilities will find it easier to develop mathematical problem-solving strategies (Nurmita, 2017, p. 45). Meanwhile, students who lack confidence will believe that they are incapable of solving mathematical problems, even if they are only simple mathematical problems (Sumarmo et al., 2018);(Tresnawati et al., 2017).

Aside from problem-solving ability and self-confidence, early mathematical ability is a determining factor (KAM). According to Uno, the importance of initial abilities in increasing the meaningfulness of learning will further aid students in the internal process of learning. KAM has a relationship with learning outcomes and KAM can predict student learning success in the future, both regarding the material that has been studied and other broad knowledge (Hamzah B. Uno, p. 159).

According to Winkel (Praptiwi & Handhika, 2012, p. 42), students need initial abilities to achieve instructional goals. This means that a student's initial ability will influence the indicators of success in the learning process. This is due to the fact that a coherent concept must be learned. Students will benefit from knowing and understanding the previous learning before moving on to the new learning section.

According to Lestari's research, early mathematical abilities have a strong influence on student learning outcomes; thus, students' initial abilities will increase if students give practice time and read outside of class hours as a source of knowledge beginning (Lestari, 2017).

According to the explanation provided above, problem-solving ability and self-confidence are critical aspects to improve during the mathematics learning process. One important factor is that teachers are encouraged to consider students' diverse KAM when selecting appropriate approaches and learning models so that problem-solving abilities and students' self-confidence can improve. However, the teacher continues to pay insufficient attention to students' KAM before beginning the learning process, so the learning model used is still centered on the teacher (teacher center), who is still unable to achieve the learning objectives.

Another factor that contributes to students' low problem-solving abilities and mathematical self-confidence is the teacher's inability to motivate students to understand and solve a given problem. The choice of the appropriate learning method and model will have an impact on the teacher-student learning process, allowing for an increase in problem-solving abilities and students' confidence in answering questions. The implementation of such a learning process is expected to achieve educational goals in accordance with national ideals, specifically the intellectual life of the nation.

According to Isjoni (2009: 13-14), three components of educational innovation must be considered: curriculum renewal, improving the quality of learning, and the effectiveness of learning methods. As consequence, teachers should create and implement a learning model that engages students. Learning with the PBL (Problem Based Learning) model is one of the learning models that are in connection with developments and innovations and can support problem-solving abilities and students' self-confidence. Apart from providing authentic experiences that encourage each student to learn actively, construct knowledge, and integrate the context of learning in school and scientifically real learning, the Problem Based learning (PBL) model is a learning model that provides authentic experiences that encourage each student to learn actively, construct knowledge, and integrate the context of learning in school and scientifically real learning. Thus, in this model, each student is required to develop their knowledge and attempt to discover the knowledge required without relying on students with higher abilities (Arnidha & Noerhasmalina, 2018, p. 48).

Other learning models must be used in addition to the Problem Based Learning (PBL) learning model to help students develop problem-solving skills and self-confidence. A cooperative learning model is one approach that can help with this. The cooperative model not only increases students' enthusiasm for learning, but it also increases students' attitudes toward helping in groups and social behavior.

The Group Investigation (GI) cooperative learning model is used as a solution to learning problems because of three basic concepts: inquiries, knowledge, and group dynamics based on learning story questions. Learning inquiry Mathematics helps students in problem-solving. Providing opportunities for students to find strong facts/evidence to support their ability to solve story problems.

Knowledge/acquired knowledge directly or indirectly from experience will also contribute to students' ability to solve story problems. Meanwhile, group dynamics can overcome students' difficulties in solving story problems because there are friends in different groups who can aid one another (Kamsiyati et al., 2014, p. 154).

The results of Nurqolbiah's research concluded that there was no difference in self-confidence between students who received learning with a problem-based learning model with a scientific approach and students who received learning with a scientific approach (Nurqolbiah, n.d.). However, based on the results of Jaya's research, Waluyo & Siswanto concluded that the Confidence of SMA Negeri 4 Semarang students increased through the implementation of the PBL model on SPLTV material. Therefore, there is an interaction of various relevant research results, this study aims to directly test whether there is an interaction of learning models (Problem Based Learning and Group Investigation) and KAM on problem-solving abilities and students' self-confidence (Jaya et al., 2019).

If we resume the theoretical study, as explained previously, achievement can be interpreted as the achievement of learning objectives in each indicator of competency achievement in the form of learning achievement targets, one of which can be developed by involving students directly in learning to obtain mastery of the material. optimally for students As a result, it is necessary to consider an appropriate learning model that can liven up the atmosphere during the learning process to achieve learning objectives (Royani & Saufi, 2016). There has been no research to date that discusses differences in problem-solving abilities and student self-confidence among students who learn using PBL and GI models. As a result, this study examines and defines the differences in students' problem-solving abilities and self-confidence when learning using the PBL and GI models.

METHOD

This research was performed out at MA Darul Quran Deli Serdang in October 2021. In general, the aim of the research is to use learning models to analyze and discover the differences and interactions between learning abilities. The research method used is a quantitative method based on these objectives. The experimental approach is being used in the study because it will include treatment and is intended to investigate possible causal relationships by exposing one or more experimental groups and one or more experimental conditions (Syamsuddin A. R & Damianti, 2006, p. 150). This study employs an experimental research design with a quasi-experimental design. The study's sample grouping was completed using previously formed or existing groups. The experimental class is another name for this experimental group.

This study's population was all class X IPA MAS Darul Quran Deli Serdang, which consisted of 7 classes and 210 students. Samples were drawn at random from all classes X MA Islamic Boarding School Darul Quran Deli Serdang, with a description of 1 class as experimental class I in class X MIA-2, which has 35 students and is taught using the Problem Based Learning (PBL) learning model, and 1 class as experimental class II in class X MIA-3, which has 35 students and is taught using the Group

Investigation (GI) learning model. A self-confidence questionnaire and a test of problem-solving abilities were used as the instruments. The data collection tools and instruments were validated before being used in the research. The content, format, language, and suitability of problem-based learning and group investigation models are all considered during tool validation. In the meantime, instrument validation was used to determine the items' validity, reliability, discriminatory power, and level of difficulty.

Based on the data collection technique used, the type of data obtained is quantitative data. The data obtained from the problem-solving ability scores and students' self-confidence in mathematics were grouped according to learning (Problem Based Learning and Group Investigation), and the students' initial mathematical ability (high, medium, low). The grouping criteria based on the mean ($\bar{X}$) and standard deviation (SD) are presented in Table 1 below:

Table 1 Criteria for Early Mathematical Ability (KAM) Grouping

Criteria	**Categori**
KAM $\geq \bar{X}$+SD	High/top group students
$\bar{X}$-SD < KAM < $\bar{X}$+SD	Medium group students
KAM $\leq \bar{X}$-SD	Low/low group students

The data analysis techniques used are descriptive statistical analysis and inferential statistical analysis. Descriptive data analysis was conducted to describe the research questions by using tables of frequency, average, variance and percentage. Inferential statistical analysis includes normality test, homogeneity test, average difference test and hypothesis testing. The statistical hypothesis that is proposed to be tested by using a two-way ANOVA test is formulated as follows:

Test Hypothesis 1

The first hypothesis to be tested in this study is whether or not there is a significant difference in the average post-test score between the problem-based learning class and the group investigation class. The following statistical hypotheses are proposed to be tested with the two-way ANOVA test:

$H_0: \beta_j = 0$

j = 1,2

$H_1 : one\ of\ \beta_j \neq 0$

Description:

β_j : Additive Effects Problem solving ability of students who are given the *j* learning model

Test Hypothesis 2

$H_0: \beta_j = 0$

j = 1,2

$H_1 : one\ of\ \beta_j \neq 0$

Description:

β_j : Additive effect the ability of students' self-confidence given the *j* learning model

Test Hypothesis 3

$H_0: (\alpha\beta)_{ij} = 0$

$H_1 : at\ least\ one\ (\alpha\beta)_{ij} \neq 0$

Description:

$(\alpha\beta)_{ij}$: The interaction between learning models and KAM on students' problem-solving abilities

Test Hypothesis 4

$H_0: (\alpha\beta)_{ij} = 0$

$H_1 : at\ least\ one\ (\alpha\beta)_{ij} \neq 0$

Description:

$(\alpha\beta)_{ij}$: The interaction between learning models and KAM on students' self-confidence

RESULT AND DISCUSSION

The goal of this study is to compare the problem-solving abilities and self-confidence of students who are taught using the *Problem Based Learning* (PBL) and *Group Investigation* (GI) learning models. This study was conducted in two classes: Experiment 1, which was taught using the *Problem Based Learning* (PBL) model, and Experiment 2, which was taught using the *Group Investigation* (GI) model. A problem-solving ability test and a student self-confidence questionnaire were used to collect data.

Data on Students' Initial Mathematical Ability

Before using the learning model, students were given an initial mathematical ability test during the research. Students are given an initial mathematical ability test to determine which ability groups (high, medium, and low) they belong to. Table 2 shows the results of the grouping.

Table 2. describes the KAM values of students based on the learning model.

Class	**KAM**	**N**	**Mean ($\bar{X}$)**	**Standard Deviation (SD)**	x_{min}	x_{max}
PBL	High	8	82,88	2,03	83	88
	Medium	19	66,15	9,70	51	80
	Low	8	46,38	2,55	43	49
Sum		35	66,14	15,34	43	88
GI	High	7	79,29	2,92	76	83
	Medium	21	60,09	7,84	49	73
	Low	7	46,29	1,70	43	48
Sum		35	61,18	12,33	43	83

Student Problem Solving Ability Test Data

The two classes were given a post-test after learning using the Problem Based Learning model in experimental class I and the Group Investigation model in experimental class II to determine the development of problem-solving abilities. The following table quantifies the category of students' problem-solving abilities in the PBL learning model:

Table 3. Assessment of Student Problem Solving Ability Using the PBL Model.

No	Value Interval	Total students	Level of Completeness	Rating Category
1	0-55	1	2,86 %	Less
2	56-70	5	14,29 %	Enough
3	71-85	21	60 %	Good
4	86-100	8	22,86 %	Very Good

The majority of students in the problem-based learning class are in a good category, with a percentage of 60%, indicating that students who are taught using the PBL model have good problem-solving abilities. As a result, problem-based learning has a good effect on the experimental class. Furthermore, the ability assessment category of students who are taught to use the GI model, namely;

Table 4. Assessment of Student Problem Solving Ability Using the GI Model.

No	Value Interval	Total students	Level of Completeness	Rating Category
1	0-55	6	17,14%	Less
2	56-70	15	42,86%	Enough
3	71-85	10	28,58%	Good
4	86-100	4	11,42%	Very Good

With a percentage of 42.86% in the group investigation learning class, most students are in the sufficient category, indicating that the problem-solving abilities of students taught by the GI model are sufficient. As a result, group investigation learning has a significant effect on the experimental class.

The description of the post-test results of students' problem-solving abilities with descriptive statistics for experimental class I and experimental class II obtained the lowest score (X_{min}), the highest score (X_{max}) and the calculation of the average score ($\bar{X}$) and standard deviation (SD) is presented in following table:

Table 5. Problem Solving Ability of PBL Class and GI Class Students

Class	Maximum Score	N	Post Test Score			
			X_{min}	X_{max}	$\bar{X}$	SD
Experiment Class I (PBL)	100	35	55	95	79,29	9,40
Experiment Class II (GI)	100	35	45	95	70,14	12.98

Before testing the normality and homogeneity of variance on the post-test data of mathematical problem-solving abilities, the data is tested using a two-way ANOVA test to determine whether or not the difference in the average post-test score between the problem-based learning class and the group investigation class is significant. The normality test was used to determine whether or not the post-test data were normally distributed. In both data classes, the normality test was performed using the *Kolmogorov-Smirnov* statistical test. Table 5 shows the results of the calculation of the post-test data

normality test of students' mathematical problem-solving abilities in problem-based learning and group investigation classes:

Table 6. Post Test Normality Test Student Problem Solving Ability (SPSS 21.0)

Tests of Normality

Kelas		**Kolmogorov-Smirnov[a]**			**Shapiro-Wilk**		
		Statistic	df	Sig.	Statistic	Df	Sig.
KPM	PBL	.136	35	.102	.953	35	.136
	GI	.126	35	.179	.967	35	.356

a. Lilliefors Significance Correction

The significance value of the post-test data distribution normality test of students' problem-solving abilities in the problem-based learning class and in the group investigation class is greater than i α = 0.05, as shown in the table above. This means that the post-test data on the problem-solving ability of the two groups of sample data are normally distributed. The homogeneity test was used to determine the homogeneity of the variance of the two classes of post-test data on mathematical problem-solving abilities between the problem-based learning class and the investment group class. The homogeneity test was performed using SPSS 21 and the *Homogeneity of Variances (Levene Statistics)* test.

Table 7. Homogeneity Test of Students' Problem-Solving Ability Post Test (SPSS 21.0)

Test of Homogeneity of Variances			
KPM			
Levene Statistic	df1	df2	Sig.
.197	1	68	.658

Table 7 shows a significance value of 0.658 for the post-test of problem-solving abilities, which is greater than a significance value of 0.05, so $H_0$is accepted, stating that there is no difference in the variance of the posttest scores of the problem-based learning class and the group investigation class. As a result, the variance for the problem-based learning class and the group investigation class for the post-test of problem-solving ability is the same.

Student Confidence Ability Test Data

A student self-confidence questionnaire with 33 questions was used to collect data on student confidence. The questionnaire used represents five aspects of students' self-confidence: believing in their abilities, making decisions independently, respecting themselves and their efforts, being enthusiastic when expressing opinions in discussions, and being willing to face challenges. At the end of the lesson, students in the problem-based learning and group investigation classes were given this self-confidence questionnaire. According to the data from the most recent meeting, the lowest score (X_{min}), highest score (X_{max}), average score ($\bar{X}$), and standard deviation (SD) for the problem-based learning and group investigation class were as follows:

Table 8. Data on the results of the last meeting of students' self-confidence

Class	Score	N	X_{min}	X_{max}	$\bar{X}$	SD
PBL	100	35	52	97	82,08	9,59
GI	100	35	52	93	76,43	9,31

As per the table above, the average self-confidence questionnaire score for the problem-based learning group is higher than the investigation group. A two-way ANOVA method was conducted to test whether or not the difference in the average score of the student self-confidence questionnaire between the problem-based learning class and the group investigation class was significant. Previously, they had to test student self-confidence questionnaire data for normality and homogeneity of variance.

Table 9. Normality Test of the Last Meeting Student Self Confidence Questionnaire

Tests of Normality

Kelas		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	Df	Sig.
KPM	PBL	.135	35	.105	.946	35	.086
	GI	.128	35	.162	.965	35	.317

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Table 9 shows that the significance value of the Kolmogorov-Smirnov test in the last meeting scores of students' confidence in the problem-based learning and group investigation classes was 0.105 and 0.162, respectively. The significance value of the two classes is greater than $\alpha = 0.05$, implying that the last meeting of students' confidence who received problem-based learning and group investigation learning demonstrated that the data were normally distributed. The next step is to use Levene's test to determine the homogeneity of the variance of students' self-confidence questionnaire scores. The following is a summary of the homogeneity test results on student self-confidence questionnaires, as shown in Table 9 below:

Table 10. Homogeneity Test of the Last Meeting Student Confidence Questionnaire (SPSS 21.0)

Test of Homogeneity of Variances			
Self Confidence			
Levene Statistic	df1	df2	Sig.
.163	1	68	.688

Table 10 shows that the significant value of 0.688 last meeting score of confidence is greater than the significance level of = 0.05, allowing H_0 to be accepted, which states that the two samples come from populations with homogeneous variance. As a result, the variance data for the problem-based learning group and the investigation group for students' self-confidence are the same (homogeneous).

Hypothesis Testing Analysis

The students' self-confidence data stated that the data for both classes were normally distributed and the variance of the two classes was homogeneous based on the results of the normality and

homogeneity test scores of the last meeting of the two classes. In addition, a two-way ANOVA test will be used for statistical analysis.

Test Hypothesis 1 and Test Hypothesis 3

The first hypothesis to be tested in this study is to knowing the difference in the average post-test score between the problem-based learning class and the group investigation class was significant or not. The results of calculations with the help of SPSS 21.0 with the output results can be seen in the following table 11:

Table 11. Two-way ANOVA Test Results

Tests of Between-Subjects Effects

Dependent Variable: Kemampuan Pemecahan Masalah

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1391.139[a]	5	278.228	1.828	.120
Intercept	309182.428	1	309182.428	2030.933	.000
Model	828.389	1	828.389	5.441	.023
KAM	286.356	2	143.178	.940	.396
Model * KAM	241.652	2	120.826	.794	.457
Error	9743.147	64	152.237		
Total	391500.000	70			
Corrected Total	11134.286	69			

a. R Squared = ,125 (Adjusted R Squared = ,057)

Table 11 shows that the calculated significance value for the learning model factor is 0.023. H_0 is rejected because the calculated significance value is less than the significance level value of 0.05. This means that students who receive problem-based learning and group investigation have different problem-solving abilities. A significance value of 0.457 was obtained for the learning factor and KAM. Because the significance value is greater than 0.05, H_0 is accepted, indicating that there is no interaction between the learning model and KAM on students' problem-solving abilities.

Based on the research data that has been described, it shows that Problems Based Learning has a positive impact in the form of forming mathematical problem-solving abilities. This is in line with the research of Harisantoso, Miftahus and Suhartini researching the effect of problem based learning (PBL) models on students' mathematical problem-solving abilities that students who study with PBL have better abilities in problem-solving aspects than direct learning (Harisantoso et al., 2020).The results of research by Latifah who examined the effect of problem based learning learning models on students' mathematical problem-solving abilities also showed that there was an influence of problem based learning models on students' mathematical problem-solving abilities (Latifah & Karim, 2019).

One of the factors that causes the problem-solving abilities of students who are given problem-based learning is better than students who are given group investment learning is the stage of problem-based learning which has a major influence in training and developing students' problem-solving abilities. For example, at the stage of guiding individual and group investigations, when a problem is given, students will think how to find something related to the problems encountered in forming a concept to be applied in solving problems on the student activity sheets that have been given. During the process of guiding individual and group investigations, students will indirectly relate the problem to their knowledge in order to find answers based on supporting facts and concepts and the teacher as a facilitator.

Group investigation learning involves students researching several sources, proposing several topics, categorizing suggestions then joining their groups to study the topics they have chosen, group composition is based on students' interests and must be heterogeneous, and the teacher assists in gathering information and facilitating arrangement. Thus, it is expected that students can learn actively both individually and in study groups. However, in practice, it takes a long time for students to determine the topic and interrogate it so that it will have an impact on student learning outcomes. Likewise, students are less skilled in working on problem-solving ability test questions whose content is the same as problem-based learning. In addition, the discussion time for problem-based learning is more than the discussion time for group investigation learning. With sufficient time for discussion, students will better understand the given problem and the process of solving the problem. Based on this, it can be concluded that the problem-solving ability given problem-based learning is better than group investigation, so that there are differences in problem-solving abilities between students who are taught problem-based learning and students who are taught group investigation.

Test Hypothesis 2 and Test Hypothesis 4

The next hypothesis that will be tested in this study is to test the difference in the average score of the self-confidence questionnaire and the interaction between the Problem Based Learning class and the group investigation class is significant or not. The results of calculations with the help of SPSS 21.0 with the output results can be seen in the following table 12.

Table 12. Two-way ANOVA Test Results

Tests of Between-Subjects Effects

Dependent Variable: Self Confidence

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1336.604[a]	5	267.321	3.160	.013
Intercept	358401.630	1	358401.630	4237.335	.000
Model	477.217	1	477.217	5.642	.021
KAM	751.261	2	375.630	4.441	.016

Model * KAM	20.291	2	10.145	.120	.887
Error	5413.239	64	84.582		
Total	446627.000	70			
Corrected Total	6749.843	69			

a. R Squared = ,198 (Adjusted R Squared = ,135)

Table 12 shows that the calculated significance value for the learning model factor is 0.021. H_0 is rejected because the calculated significance value is less than the significant level value = 0.05. This means that students who receive problem-based learning and group investigation have different levels of self-confidence. A significance value of 0.887 was obtained for the learning factor and KAM. Because the significance level value is greater than 0.05, it is accepted, indicating that there is no interaction between the learning model and KAM on students' self-confidence.

From the difference in the average self-confidence of students in the two classes, it was found that the self-confidence of students taught by problem-based learning was better than that of students taught by group investigation. Based on the research of Sugiarti and Sintha which states that learning using a problem based learning model in class VII SMP Negeri 9 Yogyakarta has a better effect on students' self-confidence (Sugiarti & Dewanti, 2018).

In Problem Based Learning, students are expected to be able to develop self-confidence through discussion in study groups, actively asking questions and expressing opinions, collaborating with other students in groups during learning. This can be seen at the stage of organizing students to learn which includes directing students to form groups, divide learning tasks in solving problems, cooperate with each other and be actively involved in learning. At this stage the learning initiative and student responsibility are formed. In addition, at the stage of investigating a person or group, students are directed to identify problems, collect as much information as possible from books or other relevant sources and exchange ideas, so that simultaneously students automatically form utilize and search for relevant resources, set learning targets and goals and develop self-confidence. In addition, the questions in the LKPD support the development of student learning independence with the teacher as a facilitator. Thus, students who receive problem-based learning are more enthusiastic in the learning process so that students can fulfill the statements in the learning self-confidence questionnaire.

Meanwhile, in group investigation learning, students are also expected to be able to develop students' self-confidence. With investigative activities, students' self-confidence can be formed, although in their learning activities the teacher's role as a facilitator has a big influence, so students can learn with confidence which is still lacking because they are still afraid of mistakes or trying new things. Students are asked to be more active in the learning process, ask and discuss in identifying problems to find and collect learning materials. In the process of collecting learning materials, students are directed to use other reference sources to facilitate the discussion process when answering problems, so that

students have the confidence to solve the problems given. Thus, students' self-confidence can be formed gradually. However, this learning process takes quite a long time and there is much to be done through the process. Students are also worried that they do not dare to start a long process and have an impact on their learning outcomes.

CONCLUSION

Based on the findings of this study's data analysis and discussions, the conclusions reached are that there are differences in abilities taught by the PBL model and students taught using the GI model, but there is no interaction between abilities and learning models on students' KAM. In more detail, it can be concluded that: 1) Students who are taught problem-based learning have greater problem-solving ability than students who are taught group investigation. This is evident from the results of the analysis (ANAVA) of two paths, specifically the value of Sig 0.05 with a value of 0.023, indicating that it is rejected. In the problem-based learning class, the average score for students' problem-solving abilities is 79.29, while the average score in the group investigation class is 70.14. Students in both experimental classes performed best on the indicators of understanding the problem and planning problem-solving. 2) The learning model and early mathematical abilities have no effect on problem-solving abilities. This is demonstrated by the results of the ANAVA analysis of two paths, namely the value of Sig> 0.05 with a value of 0.457 is accepted. The average score obtained by students in this class is higher than the average score obtained by students in the group investigation learning class, indicating that problem-based learning is more influential in achieving students' problem-solving abilities. Students who are taught problem-based learning have higher self-confidence than students who are taught through group investigation. 3) This is evident from the results of the two-way ANOVA analysis, specifically the value of Sig 0.05 with a value of 0.021, indicating that it is rejected. The average self-confidence score for students in the problem-based learning class is 82.08, while the average score for students in the group investigation class is 76.43. Students in both experimental classes performed best on the indicators of believing in their own abilities and being enthusiastic when expressing opinions in discussions. 4) There is no interaction between the learning model and the initial mathematical ability on self-confidence ability. This is supported by the results of the two-way ANOVA analysis, which show that the value of Sig > 0.05 with a value of 0.842 is acceptable. The average score obtained by students in this class is higher than the average score obtained by students in the group investigation learning class, indicating that problem-based learning is more influential in achieving students' self-confidence. Thus, problem-solving ability and self-confidence taught through the problem-based learning model are distinct and superior to those taught through the group investigation model. This is because students perform better when they are taught using the problem-based learning model rather than group investigation. Students' adaptation to the group investigation learning model is also influenced by time allocation during learning.

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