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The Effectiveness of Case Study-Based Hybrid Learning on Students Problem-Solving Ability Based on MIA

Arief Agoestanto, Rochmad, Kholifatu Ulil Azmi, and Rembulan Permata Octalia

Universitas Negeri Semarang

Correspondence should be addressed to Arief Agoestanto: arief.mat@mail.unnes.ac.id

Abstract

Problem-solving skills must be familiar to students in any condition. However, during the pandemic, students have not optimally mastered this ability. At the end of the pandemic, case study-based hybrid learning is highly recommended in higher education. The objective of this research is to analyse the effectiveness of case study-based hybrid learning on problem-solving skills which are detailed: (1) analysing the completeness of students' problem-solving ability of case study-based hybrid learning classically, (2) analysing the completeness of students' problem-solving ability of case study-based hybrid learning based on Mathematics Initial Ability (MIA), (3) analysing the difference in the completeness of students' problem-solving ability of case study-based hybrid learning with problem-based hybrid learning, (4) analysing the difference in students' problem-solving ability of case study-based hybrid learning with problem-based hybrid learning based on MIA. This quantitative research took 6th-semester students of the Mathematics Education Study Program of Universitas Negeri Semarang who took the Statistics of Education course in the 2021/2022 academic year as the population. Of the 6 classes, two were randomly selected as samples. The research design used a post-only control design. How to collect data with a problem-solving ability test. Data were analysed using the z-test and independent t-test. From the research obtained the results (1) the problem-solving ability of students of Hybrid learning based on case study problems is classically complete both by mean and proportion, (2) students with high MIA and medium, are complete by mean and proportion, while students with low MIA have not completed by mean and proportion, (3) there is no difference in the completeness of the problem-solving ability of students of hybrid learning based on case study problems with hybrid learning based on problems, (4) there is a difference in the problem-solving ability of medium MIA, there is no difference in low and high MIA in both learning models.

Keywords: Problem-solving *skills, hybrid learning, case study.*

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Abstrak

Kemampuan pemecahan masalah harus dibiasakan bagi mahasiswa dalam kondisi apapun. Namun pada *masa pandemi, mahasiswa belum secara maksimal menguasai kemampuan tersebut. Di masa pandemi berakhir, pembelajaran hybrid berbasis studi kasus sangat dianjurkan di perguruan tinggi. Tujuan penelitian ini adalah untuk menganalisis efektivitas pembelajaran hybrid berbasis studi kasus terhadap kemampuan pemecahan masalah yang dirinci: (1) menganalisis ketuntasan kemampuan pemecahan masalah mahasiswa pada pembelajaran hybrid berbasis studi kasus secara klasikal, (2) menganalisis ketuntasan kemampuan pemecahan masalah mahasiswa pada pembelajaran hybrid berbasis studi kasus berdasarkan Kemampuan Awal Matematika (KAM), (3) menganalisis perbedaan ketuntasan kemampuan pemecahan masalah mahasiswa pada pembelajaran hybrid berbasis studi kasus dengan pembelajaran hybrid berbasis masalah, (4) menganalisis perbedaan kemampuan pemecahan masalah mahasiswa pada pembelajaran hybrid berbasis studi kasus dengan pembelajaran hybrid berbasis masalah berdasar KAM. Penelitian kuantitatif ini mengambil mahasiswa semester 6 Program Studi Pendidikan Matematika Universitas Negeri Semarang yang mengambil mata kuliah Statistika Pendidikan tahun ajaran 2021/2022 sebagai populasinya. Dari 6 kelas dipilih 2 kelas sebagai sampel, dengan cara random sampling. Desain penelitian menggunakan post-only control design. Cara pengambilan data dengan tes kemampuan pemecahan masalah. Data dianalisis menggunakan uji z, dan uji t independen. Dari penelitian diperoleh hasil (1) kemampuan pemecahan masalah mahasiswa pada pembelajaran Hybrid berbasis permasalahan studi kasus tuntas secara klasikal baik mean maupun proporsinya, (2) mahasiswa dengan KAM tinggi dan sedang tuntas secara mean dan proporsinya, sedangkan mahasiswa dengan KAM rendah belum tuntas secara mean dan proporsi, (3) tidak terdapat perbedaan ketuntasan kemampuan pemecahan masalah mahasiswa yang pembelajaran hybrid berbasis masalah studi kasus dengan pembelajaran hybrid berbasis masalah, (4) terdapat perbedaan kemampuan pemecahan masalah KAM sedang, tidak terdapat perbedaan KAM rendah dan tinggi pada kedua model pembelajaran.*

INTRODUCTION

The World Health Organization (WHO) declared the COVID-19 outbreak, Corona, a pandemic on March 11, 2020, and became a worldwide conversation. The outbreak was first detected in Wuhan, Hubei, China, on December 31, 2019. The virus is spreading in all countries, including Indonesia. The Indonesian government made several efforts to stop the spread of and minimise the impact of the coronavirus. Indonesia implemented a physical distancing policy (Zahra & Wijayanti, 2020). Physical distancing results in most activities being carried out from home. This directive influenced the progress of diverse sectors in Indonesia, including education. Circular Letter Number 4 of 2020 regarding the Implementation of Education Policies amid the Emergency Period of the COVID-19 spread stipulates that, during the pandemic, educational activities are conducted through online means, utilising internet networks without the necessity for in-person, face-to-face interactions between teachers and students. Since the letter was published, almost all schools and universities in Indonesia have taken a policy to conduct online or distance learning (PJJ) (Mukaromah, 2020). Teaching and learning activities are carried out using various applications, such as WhatsApp, Google Classroom, Zoom, and Google Meet. Online learning has positive and negative impacts on schools and universities. Fahmi and Cipta (2020) stated that online learning was chosen due to its considerable flexibility, enabling learning to occur from any location through websites and mobile platforms.

However, researchers' observations and brief discussions with several lecturers noted that in online learning, students' participation in attending lectures was less robust than in traditional offline learning. Similarly, there was a decline in problem-solving proficiency compared to offline learning. This is exemplified by the performance of students in Basic Statistics lectures on Central Tendency during the 2021/2022 odd semester, where only 50% of students could solve the problems.

In contrast, during the 2019/2020 odd semester, 65% of students demonstrated the ability to solve similar problems. This situation is also supported by Ningsih (2016), who reported that students' problem-solving skills were in a low category, namely 43.62%.

Problem-solving ability is a fundamental and crucial skill in learning mathematics. This follows the opinion of Pakarinen and Kikas (2019) that problem-solving is a complex ability that is important for students to learn. According to Polya (1973), problem-solving ability is a fundamental human activity. Most humans are aware of problems, and human thoughts are directed toward finding ways to solve these problems. Siregar et al. (2022) explained that problem-solving ability is a cognitive process of analysing previously acquired concepts, rules, and knowledge to be used in finding the right strategies and solutions to solve problems. According to Muslim (2017), problem-solving ability is the ability of students to solve problems that are not routine, which in solving require other concepts and cannot be done directly but must use steps to solve them. One of the problem-solving steps is based on Polya (1973), including (1) understanding the problem, (2) devising a plan, (3) carrying out the plan, and (4) looking back.

Proficiency in problem-solving plays a vital role in mathematics education for several reasons. Firstly, it is considered a fundamental objective in learning mathematics, serving as the subject's essence. Secondly, problem-solving encompasses essential methods, procedures, and strategies that form the core of the mathematics curriculum. Lastly, problem-solving is recognised as a foundational skill in learning mathematics (Andriani, 2017). According to Putri et al. (2019), the acquisition of problem-solving skills is highly significant in the study of mathematics as it enables students to tackle challenges within the realm of mathematics and in practical, real-life situations. Nasution et al. (2018) mentioned that mathematical problem-solving ability is the ability to use mathematics to solve various everyday problems. With the ability to solve mathematical problems, students can use mathematical problem-solving thinking patterns in everyday life. By familiarizing themselves with problem-solving, students are also trained to be resilient in facing challenges, diligent, and confident in completing the assigned tasks.

Recognising the significance of problem-solving skills and acknowledging that students have not fully mastered this ability, particularly amid the pandemic, there is a need for innovative approaches to learning. One such approach is the implementation of the hybrid learning model. According to Wardhani and Indratmoko (2022), several universities have implemented hybrid learning. The hybrid learning model is an instructional approach that integrates traditional face-to-face teaching with online learning (Aristika & Juandi, 2021). This method combines in-person classroom instruction with online learning, and the blend of these two approaches can be adjusted based on factors such as course content and students' preferences for online learning (Potter, 2015). With the hybrid learning model, students can attend lectures online, especially students who are in their hometowns, and others can attend face-to-face on campus. The hybrid learning approach is also implemented at Universitas Negeri Semarang. Specifically, during the 2021/2022 even semester, hybrid learning is introduced in the fourth week for fourth-semester students and in the seventh week for students in other semesters.

According to Annisa et al. (2021),

the average acquisition of students' mathematical problem-solving ability using the hybrid learning model is higher than the average mathematics learning outcomes using conventional learning. With this model, it is hoped that learning can foster students' enthusiasm for learning and develop their abilities, primarily online and face-to-face problem-solving skills, and play an active role in the learning process. According to Sandra et al. (2021), the hybrid learning model is appropriate and suitable as a practical learning solution in the new average era. This model is used by delivering materials prepared before online learning, refined during face-to-face learning, and reflected together online after face-to-face. This method is considered a good combination and is expected to improve student grades, especially learning motivation. According to Sukawijaya and Sudiarta (2018), hybrid learning can increase the effectiveness and flexibility of learning. The hybrid learning approach is a viable alternative model for comprehending concepts and identifying optimal solutions to problem-solving (Lestari et al., 2021). In the new normal era, educational institutions can integrate the hybrid learning model with the case study method as a learning innovation. As described by Anggraeni (2011), the case study method is an instructional design that involves detailing a specific problem, event, or occurrence to enhance critical thinking skills and discover innovative solutions to the problem at hand. This method allows students to solve and make decisions on some instances or events in life, such as COVID-19. The case study method encourages students to set problems and conduct investigations based on the problems set through collaborative discussions (Anggraeni, 2011). Thus, students can work together to carry out the steps of case study learning to solve problems and make decisions.

According to Andriani, A. (2016), apart from the learning model used, other factors can affect mathematical problem-solving ability, namely students' initial mathematics ability (MIA). Initial ability is knowledge or experience previously possessed by students to assist in understanding new knowledge and solving new problems (Pamungkas et al., 2017). Thus, the initial ability of first-year students is the knowledge of students about school materials, especially junior and senior high school mathematics. Students' initial ability level will affect the difficulty or ease of understanding the following material. Understanding the students' initial abilities allows educators to tailor the learning experience to match their proficiency levels, ensuring an effective and personalised learning process.

The research objectives analysed the effectiveness of case study-based hybrid learning on problem-solving skills, which were detailed: (1) analysing the completeness of students' problem-solving ability of case study-based hybrid learning classically, (2) analysing the completeness of students' problem-solving ability of case study-based hybrid learning based on Mathematics Initial Ability (MIA), (3) analysing the difference in the completeness of students' problem-solving ability of case study-based hybrid learning with problem-based hybrid learning, (4) analysing the difference in students' problem-solving ability of case study-based hybrid learning with problem-based Hybrid learning based on MIA.

METHOD

According to Creswell (2013: 232), if each participant is not randomly selected, but the researcher uses a naturally formed group such as a class, then this research is classified as a quasi-experiment. Meanwhile, Budiyono (2017) argues that quasi-

experiment research includes education research. This is based on sampling, not randomized on the subject, but based on class, so in educational research, it is tough to be grouped in true experimental. Based on the opinions of Creswell (2013) and Budiyono (2017), this research is classified as quasi-experimental research because it is in the field of education, and sampling is based on existing classes.

The design used is a post-only control design, which is drawn in Table 1 below.

Table 1. Research design

Group	Treatment	Post Test
Experiment	X	T
Control		T

The population, sample, instruments, and data analysis methods are summarised in the following research steps: (1) Determining the research population, namely 6th-semester students who take the Statistics of Education course for the 2021/2022 academic year as many as six classes; (2) Randomly selecting research samples, namely experimental and control classes, and test classes for test instruments outside the experimental and control classes. The experimental class was treated with case study problem-based hybrid learning, and the control class was treated with problem-based hybrid learning; (3) Develop a problem-solving ability test grid; (4) Develop a problem-solving test instrument based on the grids that have been made. The test in the form of descriptions consists of 4 problem solving questions on Parametric Hypothesis testing material; (5) Provided the problem solving skills test to 2 expert validators from the Mathematics Department of Universitas Negeri Semarang for valida-tion, and the results were valid; (6) Testing the problem-solving test instrument in the pilot class; (7) The test results were analyzed for reliability, and the results were reliable; (8) Prepare Semester Lesson Plan, lecturer observation sheets, student observation sheets, and validation sheets for experimental and control classes; (9) Provided the Semester Lesson Plan, lecturer observation sheet, and student observation sheet that had been prepared to 2 expert validators of Statistics from the Mathematics Department of Universitas Negeri Semarang to be validated, and the results were suitable for use; (10) Testing the equality of variance and equality of mean to get the two classes in a balanced state using GPA data from semesters 1 to 5. From the test of equality of variance and equality of mean, it is obtained that the two classes have the same variance and mean, so that the experimental class and control class are in a balanced state; (11) Grouping Mathematics Initial Ability (MIA) based on GPA using Azwar's (2005) criteria; (12) Implementing learning in experimental class with case study problem-based hybrid learning and control class with problem-based hybrid learning in 5 meetings each. The steps of hybrid learning based on case study problems are (a) Orienting students to case study problems offline and online, (b) Organizing students to learn offline and online, (c) Guiding investigations conducted by students both individually and in groups, (d) Developing and presenting case study solutions offline and online, (e) Analyzing and evaluating the case study problem-solving process offline and online; (13) Carry out the final test in the form of a problem-solving ability test in the experimental class and control class; (14) Analyzing data from the final test results. The analysis begins with a normality test using Kolmogorov Smirnov followed by the z-test to test the completeness of the proportion, one sample t-test to test

the completeness of the mean and an independent t-test to test the difference in the mean problem-solving ability of the two classes; and (15) Compiling research results.

RESULTS AND DISCUSSION

Results

1. The completeness of students' problem-solving ability in case study problem-based Hybrid learning

1.1. Completion of students' problem-solving skills of Hybrid learning based on case study problems in a mean

The mean completeness test uses a one-sample t-test. The results of descriptive analysis of students' problem-solving ability (PSA) in case study problem-based hybrid learning are presented in Table 2.

Table 2. Description of PSA Data of Hybrid Class based on Case Study Problem

	N	Mean	Std. Deviation	Std. Error Mean
Prob_solv	29	71.90	12.706	2.360

The results of the one-sample t-test with SPSS are presented in Table 3.

Table 3. One-Sample Test

	Test Value = 60.5					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Prob_solv	4.830	28	.000	11.397	6.56	16.23

From Table 3, Sig = 0.00 <0.05, so the average PSA of students is at least 61. So, the PSA of students learning hybrid based on case studies is completed on a mean basis.

1.2. The completeness of students' problem-solving ability of case study-based hybrid learning in proportion

The test of completeness by proportion using the one-sample z-test is presented in Table 4.

Table 4. Proportion test output

		Category	N	Observed Prop.	Test Prop.	Exact Sig.(1-tailed)
Prob_solv	Group 1	<= 60	5	.172	.745	.000[a]
	Group 2	> 60	24	.828		
	Total		29	1.000		

a. Alternative hypothesis states that the proportion of cases in the first group < .745.

From Table 4, Sig = 0.00 <0.05, so the percentage of complete PSA students is at least 75%. So at least 75% of students are complete in problem-solving skills, or students' problem-solving abilities in case study-based hybrid learning are complete in proportion.

2. The completeness of students' problem-solving ability in case study-based hybrid learning based on MIA

2.1. Low MIA Test of Completeness

2.1.1 Proportion completeness test

The test of completeness by proportion for Low MIA using the one-sample z-test is presented in Table 5.

Table 5. Test of Proportion of Low MIA

		Category	N	Observed Prop.	Test Prop.	Exact Sig.(1-tailed)
Prob_solv	Group 1	<= 60	3	.500	.745	.177[a]
	Group 2	> 60	3	.500		
	Total		6	1.000		

a. Alternative hypothesis states that the proportion of cases in the first group < .745.

From Table 5, Sig =0.117>0.05 is obtained, so the percentage of PSA of low MIA students who are complete does not reach 75%. So the percentage of low MIA

students who are complete has not reached 75%, or students' problem-solving ability in case study-based hybrid learning at low MIA has not been completed in proportion.

2.1.2. Test of Mean Completeness

The description of data on low MIA is presented in Table 6.

Table 6. Descriptive data of PSA on low MIA

	N	Mean	Std. Deviation	Std. Error Mean
Prob_solv	6	60.00	18.439	7.528

The mean completeness test for low MIA using a one-sample t-test is presented in Table 7.

Table 7. Test of mean completeness

One-Sample Test

	Test Value = 61					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Prob_Solv	-.133	5	.899	-1.000	-20.35	18.35

From Table 7, Sig =0.8997>0.05 is obtained, so the mean PSA of students over 61 is rejected. So, the mean PSA of low MIA has not reached 61, or the student's problem-solving ability in case study-based hybrid learning at low MIA has not been completed by mean.

2.2. Mastery Test for Moderate MIA

2.2.1. Proportion completeness test

The test of completeness by proportion for moderate MIA using the one-sample z-test is presented in Table 8.

Table 8. Test of Proportion of Medium MIA

	Category	N	Observed Prop.	Test Prop.	Exact Sig.(1-tailed)
Prob_Solv	Group 1 <= 60	2	.133	.745	.000[a]
	Group 2 > 60	13	.867		
	Total	15	1.000		

a. Alternative hypothesis states that the proportion of cases in the first group < .745.

Table 8 obtained Sig 0.00 <0.05, so the percentage of PSA students who complete at least 75% are accepted. So the percentage of medium MIA students who are complete reaches 75% or more; it is concluded that the problem-solving ability of students in hybrid learning based on case studies of medium MIA is complete in proportion.

2.2.2. Test of Mean Completeness

The description of data on moderate MIA is presented in Table 9 below.

Table 9: Description of data on moderate MIA

	N	Mean	Std. Deviation	Std. Error Mean
Prob_solv	15	73.33	8.997	2.323

The mean completeness test for moderate MIA using a one-sample t-test is presented in Table 10.

Table 10. One-Sample Test of Mean Completeness

	Test Value = 61					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Prob_Solv	5.309	14	.000	12.333	7.35	17.32

Table 10 obtained Sig = 0.00 <0.05, so that the mean PSA of students at moderate MIA is more than 61 accepted. So, the mean PSA of moderate MIA has reached 61 or more, and it is concluded that the problem-solving ability of students in

hybrid learning based on case studies of moderate MIA is complete by mean.

2.3. MIA Aptitude Test High

2.3.1. Proportion completeness test

The test of completeness by proportion for moderate MIA using the one-sample z-test is presented in Table 11.

Table 11: High MIA Proportion Test

	Category	N	Observed Prop.	Test Prop.	Exact Sig.(1-tailed)
Prob_Solv	Group 1 <= 60	0	.000	.745	.000[a]
	Group 2 > 60	8	1.000		
	Total	8	1.000		

a. Alternative hypothesis states that the proportion of cases in the first group < .745.

Table 11 obtained Sig = 0.00 <0.05, so the percentage of PSA of high MIA students who complete at least 75% are accepted. So the percentage of high MIA students who are complete reaches 75% or more, it is concluded that students' problem solving ability in case study-based Hybrid learning at moderate MIA is complete in proportion.

2.3.2. Test of Mean Completeness

The description of data on High MIA is presented in Table 12.

Table 12. Description of data on High MIA

	N	Mean	Std. Deviation	Std. Error Mean
Prob_solv	8	78.13	8.425	2.979

The mean completeness test for high MIA using a one-sample t-test is presented in Table 13.

Table 13. One-Sample Test of Mean Completeness

	Test Value = 61					
	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference Lower	Upper
Prob_Solv	5.749	7	.001	17.125	10.08	24.17

Table 13 obtained Sig = 0.001 <0.05 so the mean student PSA is more than 61 accepted. So the mean PSA of high MIA has reached 61 or more, and it is concluded that the problem-solving ability of students in hybrid learning based on high MIA case studies is complete by mean.

3. Differences in student PSA completeness in case study-based hybrid learning and problem-based hybrid learning

The difference in PSA completeness of case study-based hybrid learning students and problem-based hybrid learning was tested using the difference in proportions test with statistics.

$$z = \frac{\frac{x_1}{n_1} - \frac{x_2}{n_2}}{\sqrt{pq\left[\frac{1}{n_1} + \frac{1}{n_2}\right]}}, \quad p = \frac{x_1 + x_2}{n_1 + n_2}, \quad q = 1 - p$$

(Sudjana, 2010).

From the data x_1=24, n_1=29, x_2=18, n_2=26, then from the calculation results obtained z=1.18, with α=5% obtained z-table=1.96. So H_0 is accepted, so there is no difference in the proportion of completeness in case study-based hybrid learning with problem-based hybrid learning.

Table 15. Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
PSA_Low	Equal variances assumed	3.377	.099	.109	9	.916	1.000	9.183	-19.774	21.774
	Equal variances not assumed			.115	7.763	.911	1.000	8.670	-19.099	21.099

Table 17. Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
PSA_ Moderate	Equal variances assumed	2.202	.149	2.632	27	.014	11.548	4.387	2.545	20.550
	Equal variances not assumed			2.592	21.711	.017	11.548	4.455	2.301	20.794

4. The difference between students' PSA in case study-based hybrid learning and problem-based hybrid learning based on MIA

4.1. Differences in problem solving ability of Low MIA students

The description of data on Low MIA is presented in Table 14 below.

Table 14. PSA description on low MIA Group Statistics

	MIA_Low	N	Mean	Std. Deviation	Std. Error Mean
PSA_Low	PBL Case	6	60.00	18.439	7.528
	PBL	5	59.00	9.618	4.301

The mean difference test of PSA for Low MIA using an independent t-test is presented in Table 15. From the SPSS output in Table 15 obtained Sig=0.916>0.05, so there is no difference in low MIA PSA in case study-based hybrid learning and problem-based hybrid learning.

4.2. Differences in the mastery of problem solving skills of Moderate MIA students

The description of data on Moderate MIA is presented in Table 16.

Table 16. Description of medium MIA PSA Group Statistics

	MIA_ moderate	N	Mean	Std. Deviation	Std. Error Mean
PSA_ Moderate	PBL Case	15	73.33	8.997	2.323
	PBL	14	61.79	14.224	3.802

The mean difference test of PSA for moderate MIA using independent t-test is presented in Table 17. From the SPSS output in Table 17 obtained Sig = 0.014 <0.05. There is a difference in moderate MIA PSA in case study-based hybrid learning and problem-based hybrid learning, with PSA in case study-based hybrid learning higher than problem-based hybrid learning.

4.3. Differences in the completeness of problem solving skills of high MIA students

The description of data on high MIA is presented in Table 18.

Table 19. Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
				t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
		F	Sig.						Lower	Upper
PSA_High	Equal variances assumed	.734	.407	-.292	13	.775	-1.161	3.979	-9.756	7.435
	Equal variances not assumed			-.296	12.916	.772	-1.161	3.916	-9.626	7.305

Table 18. Description of high MIA PSA
Group Statistics

	MIA_high	N	Mean	Std. Deviation	Std. Error Mean
PSA_ High	PBL Case	8	78.13	8.425	2.979
	PBL	7	79.29	6.726	2.542

The mean difference test of PSA for high MIA using an independent t-test is presented in Table 19. From the SPSS output in Table 19 obtained Sig =0.775>0.05, then there is no difference in high MIA PSA in case study-based hybrid learning and problem-based hybrid learning.

Discussion

The study findings indicate that students' problem-solving skills in case study problem-based hybrid learning were accomplished in terms of both mean and proportion. This is in accordance with the results of study conducted by Sujanem et al. (2016) that hybrid learning is effective for improving students' problem solving ability. Furthermore, the results of research by Annisa et al. (2021) stated that the average student problem solving ability in the hybrid learning model was higher than conventional learning. Derived from the findings of this study, it can be said that hybrid learning based on case study problems is effective on students' problem solving skills. This is because the case study problem-based hybrid learning steps provide opportunities for students to carry out problem-solving activities. The first case study problem-based hybrid learning step, namely, student orientation to the case study problem for both offline and online learning, at this stage students are given several case study problems so that students can recognize the form of the problem they will solve, and students are required to understand the concepts needed to solve the case. Once students have grasped the case study problem, then students learn to solve case study problems in groups. Students are asked to understand the case study problem by identifying the problem. In the second learning step, namely organising students to learn offline and online, students are required to define and organise learning tasks related to the case study problem during this stage. Students with their groups begin to divide tasks to each member and begin to develop a problem-solving plan.

The third learning step, namely, guiding investigations carried out by students both individually and in groups; at this stage, students begin to solve problems by investigating the case study problems. They get to collect information that will be used in solving the case study problems. The fourth learning step, namely developing, and presenting case study solutions; at this stage, students are required to present the results of solving case study problems by presenting the results of group discussions so that lecturers can find out the achievement of students'

PSA. The fifth learning step, namely analyzing, and evaluating the case study problem-solving process, this stage the problem solving process that students have carried out will be given feedback by the lecturer.

Each step of hybrid learning based on case study problems provides problem-solving activities. Therefore, students' problem-solving skills in hybrid learning based on case study problems are complete in mean and proportion. In hybrid learning based on case study problems, students are familiar with solving problems, both in groups and individually, so with this habituation over time, it will become a routine in learning, and eventually, students feel that solving problems is a necessity in learning. In solving case study problems, students must understand the concepts needed to solve the case and dare to try and check the results of their trials. This activity has an impact so that students can solve the problems given. This is in line with Rusman's (2014) opinion that problem-based learning can develop problem-solving skills. Andayani et al. (2020) also assert that problem-based hybrid learning can generate an engaging and efficient learning experience.

In the problem-based hybrid learning case study, students who take online and offline courses have the same obligation. They must be able to solve the problems in the given case study. The obstacle faced by students who attend online lectures is the unstable network in their place. This is overcome by recording lectures, and students can see the recording results so that they can re-follow the interrupted activities. This is supported by the results of Rasyida (2020), who found that unstable networks are one of the main problems in online learning but can be overcome by recording lectures.

During the learning process of the Statistics Education course, students with high MIA are more active in group discussions; they more quickly understand the concepts used to solve problems and dare to ask questions when experiencing difficulties. Students with high MIA are beneficial in group discussions because they quickly find problem-solving strategies for each problem given. Students with moderate MIA have also participated in group discussions and put forward their ideas to find problem-solving strategies. Meanwhile, students with low MIA were active and less active in group discussions. Students with low MIA who are active also put forward their ideas to find problem-solving strategies. However, when faced with new problems, students with low MIA need quite a long time to solve them compared to students with high and medium MIA. In certain groups during online learning, some students with low MIA are not active in group discussions. They tend to be silent and will answer if called first.

From the perspective of MIA, the outcomes of students' PSA in hybrid learning based on case study problems in the group of students with low MIA have not been completed in proportion and in mean. Meanwhile, the students with moderate MIA and high MIA completed both proportionally and by mean. This is undoubtedly a concern for lecturers because overall, the problem-solving ability of students is complete by mean and proportion, but based on MIA, only medium and high MIA are complete. From the lecturer's observations in learning, students with low MIA are active when discussing groups in solving case study problems, but when faced with new problems, they need a long time to solve them, so that it impacts the results of their PSA tests. This study's results align with the results of Ningsih et al. (2017), who found that student learning outcomes using blended learning increased in high MIA.

From the research results, students

with low MIA have not completed, so it should be a concern for lecturers in lectures. Looking at the phases in hybrid learning based on case study problems, all students have been stimulated to get used to solving problems. It just needs to be corrected again, such as group membership and students who take online lectures. In online lectures, lecturers sometimes have difficulty controlling student activity because inactivity caused by network constraints and inactivity caused by laziness cannot be distinguished. This aligns with the findings of the study conducted by Aisyah et al. (2021). in online learning, the average student does and collects assignments on time but is less active in giving opinions and answering lecturer questions, and even the level of asking questions is low. This is one of the factors for student incompleteness in low MIA. This is corroborated by the results of Anggraeni and Hilda (2023), that the liveliness of offline learning is higher than that of online learning. However, this is not by the results of research by Mardiana et al. (2021) which revealed that there was no difference in student activeness in offline learning and online learning.

The results of the comparison of students' PSA completeness in case study problem-based hybrid learning and overall problem-based hybrid learning showed no difference. This indicates that students who learn with case studies and students who learn with ordinary problems are not different in their problem-solving abilities. This is because students in both classes have been facilitated to solve problems; the only difference is that the problem is given. Both classes begin with an orientation to the problem, followed by solving problems in groups, presenting the results of group discussions, and ending with analysing and evaluating the problem-solving process that has been done.

The results of the comparison of PSA in the case study problem-based hybrid learning and problem-based hybrid learning obtained the results of the three different MIA groups only in the moderate group; for low and high groups, there is no difference in PSA. It can be said that those who benefit from hybrid learning based on case study problems are medium MIA. Low and high MIA have not seen many benefits. The difference in problem-solving ability of students with moderate MIA is that the case study problem-based hybrid learning is higher than problem-based hybrid learning. The difference in PSA in students with moderate MIA shows that MIA has an influence on students' problem-solving ability in hybrid learning. This is in line with the results of Zakiyah & Noor (2022), which state that there is a positive and significant influence between initial ability and problem-solving ability by 51.3%. This is also supported by the results of research by Fitri et al. (2019) which states that mixed learning models including online learning with MIA, have an effect. However, this is not by the results of research by Daulay et al. (2020) which states that there are differences in high MIA PSA in problem-based blended learning. In addition, this is not by the results of research by Fitrisari & Sari (2017) that there is no difference in MIA (high, moderate, and low) in Blended Learning. It is also inversely proportional to the results of research by Siregar et al. (2018), which states that there is no difference in the problem-solving ability of moderate MIA. However, there is a difference in low and high MIA between problem-based Blended Learning and conventional learning.

Students' problem solving ability in the case study problem based hybrid learning and problem based hybrid learning turn out to be different when viewed from MIA, which can be said that MIA influences problem solving ability. At the

stage of understanding the problem, students with high MIA easily understand the problems contained in the problem. This is because students with high MIA are used to dealing with mathematical problems so that when they are faced with new problems, they will quickly understand the problem. Like students with high MIA, most students with moderate MIA can also understand the problems contained in new problems. Meanwhile, students with low MIA sometimes still have difficulty understanding the new problems they encounter. This is indicated by the results of their work, which still has shortcomings when writing known information. According to Trianto (2009), as cited by Andriani (2017), one of the causes of students having difficulty understanding new problems is that the new problems received do not have a relationship with prior knowledge or prior abilities.

At the planning stage, students with high MIA quickly come up with ideas to develop the right problem-solving plan. Therefore, at the stage of implementing the plan, students with high MIA can implement the problem-solving plan and perform calculations correctly by the plan they have prepared. Students with moderate MIA can also develop plans appropriately and carry out problem-solving plans by the plans they have prepared. However, some students with moderate MIA sometimes still lack accuracy, so they are wrong in their calculations when carrying out problem solving. While students with low MIA are at the stage of preparing the plan, sometimes there are still errors in preparing the problem-solving plan. Students with low MIA may find it challenging to correctly execute the problem-solving plan during the implementation stage. sometimes wrong in the solution steps, and sometimes wrong in the calculations.

At the re-examination stage, students with high MIA and some with moderate and low MIA were able to re-examine the results of their work and make conclusions about the answers to the problem-solving results they had done. However, some students with moderate MIA were still wrong in writing the result in their conclusion. This also happened to students with low MIA; the conclusion of the answer they made was still wrong, and some students did not write the conclusion. Some students with moderate MIA have the same problem-solving skills as students with low MIA. However, the number of students with moderate MIA who still cannot carry out some stages of problem-solving is only a tiny portion.

Students possessing a high level of Mathematical Initial Ability (MIA) demonstrate competence in navigating through all problem-solving phases. This is consistent with Netriwati's (2016) findings, which indicate that students with elevated mathematical prior knowledge excel in accurately delineating known and unknown elements in a problem, formulating an appropriate problem-solving plan, executing the plan proficiently, and articulating a thoughtful review of their obtained answers. Prasetyo and Ramlah's (2021) research results further confirm that students with advanced initial abilities can comprehend problems, formulate effective plans, execute those plans successfully, and generate correct answers. However, they may not consistently reevaluate the problem-solving process.

Students with moderate MIA have different abilities in carrying out the stages of problem-solving. Most students with moderate MIA can carry out three stages of problem-solving. Netriwati (2016) stated that students with a moderate level of mathematical prior knowledge could understand the problems contained in the problem, can develop a problem-

solving plan appropriately, and are able to carry out problem-solving according to the plan made. However, they are unable to write down how they re-examine the answers that have been obtained. According to the findings from Prasetyo & Ramlah's (2021) study, students with moderate initial abilities face challenges in problem comprehension as they tend to overlook recording the known and asked elements in the problem. However, these students can still formulate effective plans, successfully implement them, and arrive at correct answers. Despite this, they often neglect to review the problem-solving process undertaken.

Students with low MIA can only carry out 1 to 2 stages of problem-solving. According to the results of Netriwati (2016), students with low levels of mathematical prior knowledge do not understand the problems contained in the problem, are unable to explain the results of their work, are unable to develop problem solving plans appropriately, is unable to carry out problem-solving by the plans made, is unable to explain the calculation process they have made and are unable to write down how they re-check the answers they have obtained. According to the findings from Prasetyo & Ramlah (2021), students with low initial abilities struggle with problem comprehension, have difficulty understanding the issues presented in the problem, face challenges in formulating a plan, encounter difficulties in executing the plan, and tend to neglect the re-evaluation of the problem-solving process.

Amin et al. (2020) stated that problem-based hybrid learning significantly affects students' spatial abilities. Problem-based learning has a positive impact on enhancing students' proficiency in mathematical problem-solving (Hendriana et al., 2018). Blended Learning successfully improved problem-solving skills in the second cycle (Payadnya & Jayantika, 2021). Students are improving their mathematical problem-solving skills through problem-based learning (Suryani et al., 2020).

Implication of Research

Hybrid learning based on case study problems can be applied to improve students' problem solving skills during the pandemic to normal transition. Students with low MIA need to be accustomed to solving problems independently by not depending on the solutions of their more capable friends. The difference in problem solving ability between case study-based Hybrid learning and problem-based Hybrid learning is only in medium MIA, so it is necessary to find the cause why low MIA and high MIA have no difference to obtain alternative solutions to be experimented with in further research.

Limitation

The limitations of the study include the class used as the research sample has a certain number of students so that it cannot increase the number of students in each research class. The implementation of the study was only 5 meetings, and there were still students whose lectures were online who were constrained by the signal. Group cooperation for students who use the online mode is also not as good as students who use the offline mode.

CONCLUSION

The study's findings include the following conclusion: (1) the PSA of students of hybrid learning based on case study problems is complete, (2) the PSA of students with high and moderate MIA is complete, while students with low MIA are not com-

plete, (3) there is no difference in the completeness of student PSA in hybrid learning based on case study problems with problem-based hybrid learning, and (4) there are differences in student PSA in moderate MIA, and there are no differences in student PSA in low and high MIA in both learning models.

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