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Blended Learning in terms of Intrapersonal Intelligence on Problem Solving Ability

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Abstract

The general objective to be achieved in this study is to determine the effect of using Blended Learning in terms of Intrapersonal Intelligence on Problem Solving Ability. This research is a quasi-experimental research with a two × three factorial design. Documentation, questionnaires, and tests were carried out in the data collection method. The instruments used to collect the data were the learning achievement test instrument and the student's intrapersonal intelligence questionnaire instrument. The data analysis used was ANOVA with a two-way analysis of variance 2 x 3. The prerequisite test for Variance Analysis used the Lillifors method for the normality test and the Barlett method for the homogeneity test. The results showed (1) that the implementation of blended learning geometry material resulted in better learning achievement and problem-solving abilities than conventional learning. As evidenced by student learning achievement in the experimental class is categorized as high with an average score of 70,935. At the same time, the control class is lower, with an average score of 53,792. (2)There is an interaction between the Blended Learning model and students' intrapersonal intelligence on mathematics learning achievement and problem-solving abilities. (3) There are differences in student learning achievement with blended Learning and conventional Learning seen from intrapersonal intelligence

Keywords: Blended Learning, intrapersonal intelligence, mathematical problem-solving.

Introduction

Current learning is complicated to do face-to-face. This is because the government implements an online learning policy. Online learning has several advantages and disadvantages, so learning should be done offline and online. In online learning, lecturers must prepare material to be delivered online or offline learning. Which material should be analyzed, which can be done online and which material should be done offline. The material submitted online must be packaged optimally so that it is easy to understand when presented. Most students consider the Basic Geometry course as a complex subject, and this is because these courses require high problem-solving abilities and tend to be abstract. The Basic Geometry course also carries out drawing three planes according to their actual size. One of the efforts to make it easier for students to learn these subjects is that the material must be appropriately packaged, and learning must be carried out online and offline.

The reality in the learning process still uses conventional learning with various learning media. Lecturers are still learning centers and dominate learning. Lecturers do learning by lecturing so that students are passive, and students only listen to explanations from the lecturers. Learning becomes dull and less enjoyable. This causes student achievement in learning geometry to be below. One of the strategies used for the above problems is blended learning. Blended learning unifies various learning methods that can be achieved by combining virtual and physical sources. (Yigit et al., 2014) defines: blended learning integrates or incorporates learning programs in different formats to achieve a common goal. This means blended learning integrates or combines learning programs in other forms to achieve general goals. Blended learning is a combination and various strategies for learning. So it can be said that blended learning is a learning method that combines two or more techniques and strategies in learning to achieve the goals of the learning process. (Heinze & Procter, 2010)states that "blended learning is a mixture of the various learning strategies and delivery methods that will optimize the user's learning experience." This says that blended learning is a mixture of various learning strategies and delivery methods that will optimize the learning experience for its users.

The effectiveness of blended Learning in Learning can also be seen in several previous studies, including research conducted by (Al-Qahtani & Higgins, 2013)' who concluded that "analysis shows that there is a statistically significant and educationally important difference between

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the achievement of students who used blended learning and the achievement of students who used e-learning only (studying through the asynchronous online classroom only) favoring the former group. The study concluded that there were significant results in student achievement, interest, and motivation using blended learning compared to other knowledge. This research is also strengthened by several similar studies that have obtained satisfactory results in education, including motivation, understanding, learning achievement, and solving problems in education. Here are some studies that examine the effects and benefits of blended Learning (C. D. Dziuban et al., 2013; C. Dziuban & Moskal, 2011; Miyaji, 2019; Sari et al., 2019; Uz & Uzun, 2018)*102 undergraduates-65 of them from the same department (Control 1*

So that students do not get bored quickly because the learning used is only monotonous, the learning process needs to be varied indirect Learning and online Learning. One of the enjoyable online Learning using applications www.sunan.umk.ac.id, Schoology, Edmodo. Online learning can include providing materials, viewing learning videos, creating assignments, taking quizzes, and taking tests. This learning requires supporting devices or media such as computers/laptops. This is not an obstacle for a lecturer to develop this learning, considering the development of technology today. With the development of technology, a lecturer must be creative and innovative in utilizing technological advances. One of these uses is information and communication technology-based learning media in the learning process.

Students' intrapersonal intelligence also affects student geometry learning achievement. Intrapersonal intelligence is related to self-awareness and knowledge, and students with less self-awareness and expertise are expected to have a better-blended learning process in their mathematics achievement. Intrapersonal intelligence has three aspects, while the three aspects of intrapersonal intelligence are as follows: (1) Knowing yourself, (2) Knowing what you want, and (3) Knowing what is essential. (Harry Alder, 2001: 79-97).

Based on the various considerations above, the background for the researchers to conduct this research. Researchers are interested in seeing the effect of blended learning regarding students' intrapersonal intelligence on mathematical solving abilities with conventional learning. Researchers want to see (1) whether blended learning in geometry learning results in better learning achievement than conventional learning. (2) whether there is an interaction between learning geometry and students' intrapersonal intelligence on mathematics learning achievement. (3) which one provides better learning achievement and problem-solving abilities between blended learning and conventional learning.

Method

Research Design

This research is a quasi-experimental research with a two × three factorial design. This research is a comparative study to find similarities and differences between two or more things. In addition, the comparative analysis also has the following objectives: comparing the similarities and differences of 2 or more facts and the nature of the object under study, making generalizations on the level of comparison, determining which one is better or which one should be chosen, and investigating possible cause-and-effect relationships. Compared is the story of the effectiveness of blended learning in intrapersonal intelligence and problem-solving ability. This study aims to determine whether the use of blended learning in learning geometry results in better learning achievement than conventional learning. Is there an interaction between learning geometry and students' intrapersonal intelligence on mathematics learning achievement, and which one provides better learning achievement and problem-solving abilities between blended learning and conventional learning in terms of students' intrapersonal intelligence

Population and Sample/ Study Group/Participants

The population of this study was students of the mathematics education study program at muria kudus university. The sampling technique was carried out by stratified cluster random sampling. The sample in this study were second-semester students in the experimental group and fourth-semester students in the control group. Selected 47 students who were separated into 27 students in the experimental group and 20 students in the control group. This study's data collection methods were documentation, questionnaires, and test methods. The instruments used to collect the data were the learning achievement test instrument and the student's intrapersonal intelligence questionnaire instrument.

Data Analysis

The data analysis used is a 2 x 2 two-way analysis of variance. The research design table 1.

The prerequisite test for Variance Analysis used the Lillifors method for the normality test and the Barlett method for the homogeneity test. With $\alpha = 0.05$. Scheffe's method is used to test the variance analysis further if the hypothesis is rejected.

Table 1" Research Design

	Student Intrapersonal Intelligence $()b_l$		
Learning $()a_i$	*Height* $()b_1$	*Medium* $()b_2$	*Low* $()b_2$
Blended Learning $()a_1$	ab_{11}	ab_{12}	ab_{13}
Conventional $()a_2$	ab_{21}	ab_{22}	ab_{23}

Findings

To find out whether there are differences in the mathematical problem-solving abilities of students in the experimental and control groups, it is necessary to test the hypothesis. Before the hypothesis test is carried out, the normality and homogeneity of the variance of the test results of students' mathematical problem-solving abilities are first tested. The following shows the normality test results for the experimental class and control class.

Based on table 2. the sig value means significance or may be called the p-value or probability value. Sig value. In the Kolmogorov-Smirnova column in the table above, the value is 0.017 more than 0.05, then the data is usually distributed or which means receiving H0. Likewise, in the Shapiro-Wilk column. The sig value means significance or the p-value or probability value. In the table above, the value is 0.121 more than 0.05, and it can be said that the data is usually distributed or which means receiving H0.

Based on table 3, the sig value means significance or may be called the p-value or probability value—the value of sig. on the Kolmogorov-Smirnova column. In the table above, the value is 0.200 more than 0.05, then the data is usually distributed or receiving H0. Likewise, in the Shapiro-Wilk column. In the table above, the value is 0.121, more than 0.05; it can be said that the data is normally distributed or receiving H0.

Based on figure 1, it can be seen that the plots follow the fit line, so it can be stated that the variables are normally distributed. From the tests that have been done, it is found that both classes have data on problem-solving abilities that are normally distributed and have homogeneous data variance. After being tested for normality and homogeneity of the data, it was continued with hypothesis testing, which was carried out by using the two-way ANOVA test

Based on table 4, it can be seen that the average value of problem-solving in learning in the experimental class is based on the level of students' intrapersonal intelligence with a level category of 73.1818 and a medium category average of 68.6875. At the same time, the calculation results of the average response value of problem-solving in the control class based on the level of intrapersonal intelligence of students in the high category were 54.8333, while for the medium category, it was 52.7500.

Table 2: Normality Test for Experimental Class

	Kolmogorov-Smirnova			*Shapiro-Wilk*		
	Statistics	*Df*	*Sig.*	*Statistics*	*Df*	*Sig.*
VALUE_KELAS_EKSP	.186	27	.017	.940	27	.121

a. Lilliefors Significance Correction

Table 3: Control Class Normality Test

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistics	df	Sig.	Statistics	df	Sig.
VALUE_KELAS_CONTROL	.130	20	.200 *	.963	20	.614

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

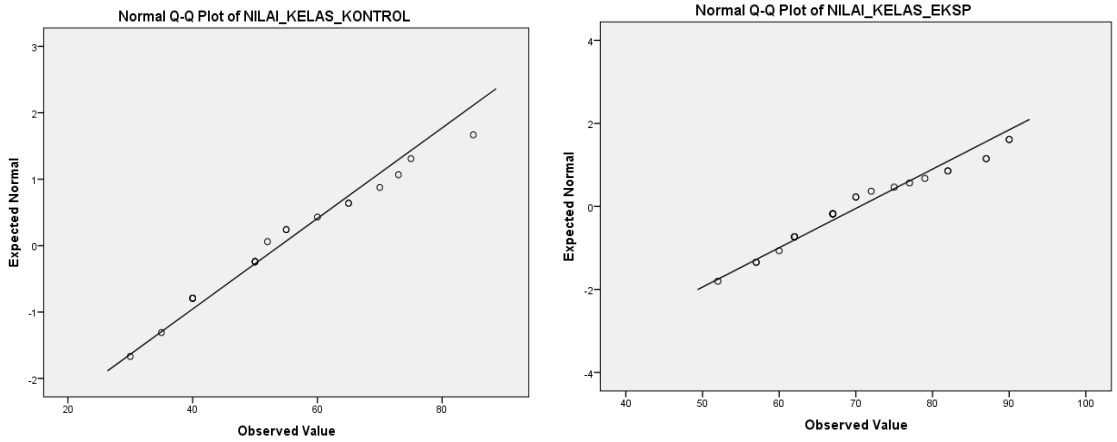

Figure 1: Normality Q-Q Plot Initial Test (Pretest) Control and Experiment class

Table 4: Two-way ANOVA hypothesis test results

Learning	*Category*	*Mean*	*Std. Deviation*	*N*
Experiment Class	High Category	73.1818	10.44814	11
	Medium category	68.6875	10,56862	16
	Total	70,5185	10.55888	27
Control Class	High Category	54,8333	15.44394	12
	Medium category	52,7500	14,36016	8
	Total	54,0000	14,66826	20
Total	High Category	63,6087	16.02197	23
	Medium category	63.3750	13.94652	24
	Total	63.4894	14.83368	47

Homogeneity Assumption: Levene Test

Below are the results of Levene's Test. Used to assess the homogeneity of each variable.

Tabel 5. Levene's Test of Equality of Error Variances

F	df1	df2	Sig.
.811	3	43	.495

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

Table 5 shows the value (Significance) of sig. 0.495 where> 0.05 (homogeneity requirement), meaning that the sample has the same variance (has met the Anova test requirements).

After the prerequisite test is met, the hypothesis is tested using the two-way analysis of variance (ANOVA) technique. Two-way ANOVA test to find out primary influence and interaction effect. The main result in this study is the effect of differences in the blended learning model on mathematics learning achievement and the interaction effect, namely the effect of the blended learning model in terms of intrapersonal intelligence on mathematics learning outcomes. The table below shows the results of the Two Way Anova test:

From table 6 we can see that based on the value (sig), if the sig value <0.05 is 0.001, it means that the model obtained is valid or significant.

Intercept:

From the table above, we can see that based on the value (sig), if the sig value <0.05, that is (0.000 <0.05), it means that this intercept contributes significantly. In this case, it can be concluded that the blended learning model has a significant effect on solving mathematical problems. The second hypothesis test shows the results, namely F count = 0.753> Ftable = 0, 390, then H0 is rejected, and H1 is accepted, which means there is an interaction between the Blended Learning model and students' intrapersonal intelligence in mathematics learning achievement. Furthermore, testing is carried out to see differences in learning achievement and learning interactions in the control class using the conventional model with the experimental class with the application of the blended learning model.

Based on table 7 the implementation of the learning model on problem-solving abilities in learning in the experimental class is categorized as high, with an average score of 70,935. At the same time, the control class is lower, with an average score of 53,792. This means that the contribution of blended learning to students' mathematical problem-solving abilities is better than the contribution of conventional education to mathematical problem-solving skills.

The following shows the results of the analysis of mathematical problem-solving abilities in terms of students' intrapersonal skills.

Table 6. Tests of Between-Subjects Effects (Problem Solving Value)

Source	*Type III Sum of Squares*	*Df*	*Mean Square*	*F*	*Sig.*
Corrected Model	3287.504a	3	1095,835	6,895	.001
Intercept	172019,153	1	172019,153	1082,318	.000
LEARNING	3249,629	1	3249,629	20,446	.000
CATEGORY_ANGKET	119,603	1	119,603	.753	.390
LEARNING * CATEGORY_ANGKET	16,069	1	16,069	.101	.752
Error	6834,241	43	158,936		
Total	199574,000	47			
Corrected Total	10121,745	46			

a. R Squared = .325 (Adjusted R Squared = .278)

From table 8, it can be seen that the ability to solve mathematical problems in students with a high level of intrapersonal intelligence is obtained at an average of 64,008. Meanwhile, the ability to solve mathematical problems in students with moderate levels of intrapersonal intelligence was acquired by an average of 60,719.

Furthermore, they are testing the differences in problem-solving results in intrapersonal intelligence both in the experimental class with the blended learning model and the control class with the conventional model. The complete calculation results can be seen in the following table.

The results in table 9 show that the average score of students in the experimental class who has high intrapersonal intelligence is 73,182 while the control class is 54,833. Then the mean score of students in the experimental class who had moderate intrapersonal intelligence was 54,833 and in the control class was 52,750. As evidenced by student learning achievement, the experimental class is categorized as high with an average score of 70,935, while the control class is lower with an average score of 53,792. There is an interaction between the Blended Learning model and students' intrapersonal intelligence on mathematics learning achievement and problem-solving abilities. There are differences in learning achievement between students in their intrapersonal intelligence using the blended learning model. Based on the calculation of the hypothesis test described above, the results show that for students who have high intrapersonal intelligence, the mean score of students who learn using the blended learning model (experimental class) is higher than the mean score of students in the control class. Besides, students with an intrapersonal intelligence level in the experimental class are also higher than those in the control class. There are differences in learning achievement between students in their intrapersonal intelligence using the blended learning model. They learn using blended learning, where student learning achievement with the blended learning model is higher, both in the high category intrapersonal intelligence and medium category.

Discussion

Blended learning is seen as the right solution to be applied in learning, considering the many benefits of its application. (Lalima & Lata Dangwal, 2017) concluded from the results of his study that blended learning is an innovative approach. Furthermore, explained in his research, "Blended Learning is, to some extent, the solution to problems prevailing in our educational system. If implemented in a well-planned, organized way with the right type of attitude, it can become the future of our educational system. To our benefit, steps for adapting blended learning are soon initiated". Based on the results of the analysis of the students' math problem-solving ability scores, it is known that the average score of students' mathematics problem-solving abilities in the experimental group is higher than the average score of students' mathematics problem-solving abilities in the control group. In other words, the mathematical problem-solving skills of students who take blended learning are better than those of students who take conventional learning. This means that blended learning

Table 7: The results of differences in learning achievement

			95% Confidence Interval	
LEARNING	*Mean*	*Std. Error*	*Lower Bound*	*Upper Bound*
Experiment Class	70,935	2,469	65,956	75,914
Control Class	53,792	2,877	47,989	59,594

Table 8. The results of the analysis of mathematical problem-solving abilities in terms of students' intrapersonal abilities

			95% Confidence Interval	
CATEGORY_ANGKET	*Mean*	*Std. Error*	*Lower Bound*	*Upper Bound*
High Category	64,008	2,631	58,701	69,314
Medium category	60,719	2,729	55,214	66,223

Table 9 The differences in problem-solving results in terms of intrapersonal intelligence

				95% Confidence Interval	
LEARNING	*CATEGORY_ANGKET*	*Mean*	*Std. Error*	*Lower Bound*	*Upper Bound*
Experiment Class	High Category	73,182	3,801	65,516	80,848
	Medium category	68,687	3,152	62,331	75,044
Control Class	High Category	54,833	3,639	47,494	62,173
	Medium category	52,750	4,457	43,761	61,739

contributes to improving mathematical problem-solving abilities.

The effectiveness of the application of blended learning in improving problem-solving abilities is also in line with research conducted by (Uz & Uzun, 2018)[102 undergraduates-65 of them from the same department (Control 1] concluded, "The findings of the study revealed that self-regulated and self-directed scores of experimental group differed significantly from the control groups' indicating that the use of blended instruction is more effective than traditional instruction in terms of developing self-regulated and self. -directed learning skills. Students in the experimental group pointed out that the blended learning environment presented rich content, easy accessibility, effective guidance, and motivation". These results are also confirmed by research conducted by (Supriadi et al., 2014), "The results showed that students 'who learned Probability and Statistics under GeoGebra-Assisted Blended Learning (GABL) have higher HOMTC than students' who received Conventional Learning (CL). There are no differences in students' HOMTC enhancement between those receiving GABL learning and CL in terms of Initial Mathematical Ability (IMA). HOMTC aspects of the students' who learned by using BLGA that have the highest enhancement are mathematical connections followed by aspects of mathematical communication, reasoning, and problem-solving".

Blended learning is not only appropriate for mathematics, which is evident in research conducted by(Kazakoff et al., 2018). These findings suggest that a blended learning approach to reading instruction, as implemented in this study, can lead to significant advances on a standardized reading test for ELs and non-ELs alike ". From the research results that have been done, it is also seen that there is a positive interaction between students in learning using blended learning compared to the application of conventional education. In addition to increasing learning interactions, the benefits of using blended learning can also be seen in students' increased motivation and interest in learning. Similar results were also seen in research conducted by (Lin et al., 2017; Murtono et al., 2020; Zamroni, Muslihati, et al., 2020). The results indicated that the attitudes of the experimental group were significantly changed, whereas the control group failed to show a similar outcome. Similarly, the results showed students in the experimental group experienced a more positive attitude toward mathematics, more enjoyment of mathematics, and more motivation to do mathematics than students in the control group. This model facilitates mathematics learning through a virtual online classroom, and it helps boost students to present their opinions. Moreover, it improves the interaction among peers and between students and teachers, and students benefit from group discussions and collaborative learning.

Similar research results are also seen in several previous studies, namely research conducted by (López-Pérez et al., 2011; Miyaji, 2011, 2019; Prescott et al., 2018; Thai et al., 2017; Uz & Uzun, 2018; Zamroni, Hanurawan, et al., 2020)[a] lecture is given by lecture slide and a small test is given at the end of the class. Students fill out a problem in a structured notebook by viewing lecture slide materials in the e-learning after a lecture. In cases where e-learning is used during school hours, the outline of class on each day is explained for about 20 minutes using slides. Students then fill out a problem in a structured notebook for about 60 minutes while viewing lecture slide materials in the e-learning. Students are required to learn at their own pace with the aim of improving their understanding of lecture contents. In the two kinds of blended classes, students plan study support systems at the end of the course. Students submit reports and evaluate them mutually. The effects of the two blended classes are compared by significant difference tests. The blended classes by the two methods improve significantly the knowledge degree of technical terms and the students' attitude. No significant differences between the two methods are observed for the knowledge degree of technical terms and the students' attitude as a whole. It is found that activities useful to improve attitude are almost similar to the two blended classes. (Contains 8 tables and 3 figures.. Where there are many advantages in the application of blended learning, including increased understanding of students and students, grew learning achievement and results, students have more robust professionalism where they develop qualities such as self-motivation, self-responsibility, discipline, and the ability to solve problems in learning as well as many more benefits from learning using blended learning.

Based on The calculation of the hypothesis test described earlier in the research results, there is an interaction between the blended learning model and intrapersonal intelligence on mathematics learning outcomes. In blended learning in this study, there is online learning through applications provided by the university. Several student characteristics are needed to succeed in online learning, including independence, willingness to self-actualize, and high initiative. This is what makes the interaction between blended learning models in intrapersonal intelligence and mathematics learning achievement. In this regard, considerations are needed in determining the blended learning model to suit the level of students' intrapersonal intelligence. Learning will be more effective if a suitable blended learning model is used. The results of this study are reinforced by research conducted by those who say that from the results (Wijayanti & Suhendri, 2017). Hypothesis testing concluded that there is an effect of intrapersonal intelligence and critical thinking together on mathematical reasoning abilities. It is recommended that teachers pay attention to the intrapersonal intelligence factor and crucial review of students in learning mathematics. Furthermore, (Zefanya, 2018)[3], in his research, found that: (1) there is an effect of intrapersonal intelligence and learning

discipline together on mathematics learning achievement; (2) there is an effect of intrapersonal intelligence on mathematics learning achievement; (3) there is an effect of learning discipline on mathematics learning achievement.

Interpersonal skills are communication carried out in a relationship between two or more people, both verbally and nonverbally, to achieve common similarities (Beale & Bost, 1979; Santrock, 2017). So this skill emphasizes one's relationship with another individual or group. Interpersonal communication is communication between people face to face, which allows each participant to catch the other's reactions directly, both verbally and nonverbally. Interpersonal skills require students to be able to absorb and be responsive to the moods, temperaments, intentions, and desires of others (Nair & Fahimirad, 2019; Quinn, 2013)research on Derald Sue's multicultural counseling competencies is provided as a foundation to further examine the evidence regarding effective cultural adaptations to mainstream treatment approaches, such as cognitive-behavior therapy and interpersonal psychotherapy. Next, a brief outline of Carl Rogers's psychotherapy research tradition is presented, with a focus on both past and present evidence suggesting that person-centered therapy may be effective across diagnoses, as well as cultures. Using psychotherapy evidence from both the latter half of the 20th century and the initial decades of the 21st century, cultural adaptations to previously hypothesized person-centered therapy mechanisms of change are proposed. In particular, this culturally adapted person-centered approach is suggested to provide a competent and effective treatment system for racial/ethnic minority clients and families. © The Author(s. With interpersonal skills, nurses are expected to be able to work together with others and create synergies to produce positive things, including effective forms of communication (Kim, 2020). As found in this study, interpersonal skills will encourage students to find out more about the problems they face so that they are encouraged to be more enthusiastic about learning. From the perspective of blended learning, communication that is built straightforwardly is essential so that students gain a complete understanding and at the same time have the same opportunity to ask questions between online and offline (C. D. Dziuban et al., 2013; Poncela, 2013; Yusoff et al., 2017; Zamroni, Muslihati, et al., 2020).

Problem-solving ability is the skill, or potential students have in solving problems and applying them in everyday life (Wattanawongwan et al., 2021). Problem-solving ability is an effort to find a solution to a situation at hand to achieve the desired goal. Problems are subjective for everyone, meaning that a question can be a problem for someone but not a problem for someone else (Tu et al., 2011). Apart from that, a query may be a problem for someone, but it is no longer a problem at a different time because that person has already obtained the solution or solution to the question. In solving problems, students are expected to understand the process of solving these problems and become skilled in selecting and identifying relevant conditions and concepts, seeking generalizations, formulating plans for solving them, and organizing skills that have been previously possessed. If students are trained to solve problems, students will have skills in how to collect relevant information, analyze information, and realize how important it is to re-examine the results obtained (Goodwin et al., 2011; Hsu & Hsieh, 2011; Lanero et al.,, 2016; Newell et al., 2011)little research has examined the factors that underlie initial worry about infection and subsequent behavioral responses to such worry. Purpose This study seeks to model some key predictors of worry and behavioral responses in the early stages of the swine flu pandemic (WHO pandemic stage 5. This study shows that students' problem-solving abilities are strongly influenced by the common obstacles often encountered during blended learning, such as lack of optimal communication and limited academic absorption due to technical constraints in network implementation. Students who have a tendency to be able to deal with problems intelligently and straightforwardly tend to be easier to overcome obstacles during blended learning and vice versa (Chiang & Lee, 2016). This shows that blended learning will successfully run according to its objectives if supported by students' good problem-solving skills. In addition, interpersonal openness can help improve the quality of student learning outcomes (Peterson, 1997; Sudikan, 2017).

Conclusion

Based on the results and discussion that has been done, the following conclusions are the implementation of blended learning geometry material results in better learning achievement and problem-solving abilities than conventional learning they learn using conventional learning, where student learning achievement with the blended learning model is higher, both in high category intrapersonal intelligence and medium category. This study shows that blended learning encourages students to practice communicating more effectively and efficiently interpersonally to get good results and absorption in education. This is driven by the desire to be able to solve problems and communicate more freely without being limited by space and time. In other words, blended learning has created space for the development of soft skills in the form of interpersonal skills and problem-solving skills that impact student achievement. Therefore, the researcher encourages future researchers to explore further the possibility of other soft skills that can be developed through blended learning. Research on blended should also be encouraged with a more varied number of samples in terms of basic abilities, cultural background, situations, and conditions during education, supporting facilities and infrastructure, and even a sound learning support system to find a perfect blended model,

mainly if it is applied to start at the school level elementary to higher education.

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