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The Analysis of Flipped Learning Model Based on Geogebra and PBL on Mathematics

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Abstract

This research is motivated by the low learning outcomes of students' mathematics with an average national exam of around 55 low, the low learning outcomes are influenced by one of various factors including learning models or methods which sometimes do not support mathematics. Based on this, an alternative learning model is needed to provide understanding both in terms of cognitive and psychomotor. In this case, the geogebra-based flipped learning model helps understand the theory and practice of mathematics. This study aims to determine the regression between flipped learning and problem based learning (PBL) learning models in learning outcomes using geogebra software. This research is in SMPN/SMPT/SMP with the subject of class VIII students. The type of research is an experiment with a 3x3 factorial design with a random sampling technique, each of which is taught using the Flipped learning and problem based learning (PBL) models. Collecting data with tests and questionnaires, while the data analysis technique using inferential analysis of MANOVA and two-way ANOVA through prerequisite, balance, hypothesis and further tests. The conclusion is the knowledge aspect, the GeoGebra flipped learning (FLG) learning model provides better knowledge aspects than the Flipped learning (FL) and problem-based learning (PBL) learning models. The FL learning model provides better knowledge aspects than problem based learning (PBL). Meanwhile, in terms of skills, Flipped learning (FL) learning model provides better skill aspects than problem based learning (PBL); in the aspect of high interpersonal communication knowledge have better knowledge aspects than students with moderate interpersonal communication and low interpersonal communication. Students with moderate interpersonal communication have better aspects of knowledge than students with low interpersonal communication. Meanwhile, in the aspect of skills, students with high interpersonal communication have better skill aspects than students with moderate interpersonal communication and low interpersonal communication. Students with moderate interpersonal communication have better skill aspects than students with low interpersonal communication.

Keywords
flipped learning; geogebra-based PBL; mathematics materials

I. Introduction

In dynamics In life, education has an important and strategic role in facing future challenges. Education has a very noble purpose for human life. The most important role of education is to prepare quality human resources who are able to compete in the

development of science and technology. National education functions to develop capabilities and form community agreements. This deficiency arises due to the lack of attention of educational personnel printing institutions that pay attention to these skills (Waluyandi, 2020). Pohan (2020) states that at school, from elementary to secondary school or even college, students undergo, practice, and experience the learning process of various knowledge and skills. Learning is essentially a cognitive process that has the support of psychomotor functions (Arsani, 2020). Education also has an influence in the intellectual life of the nation through educational institutions. Besides that, education is also very important for the strength of a nation. Therefore, it is necessary to be equipped with knowledge from various subjects contained in educational institutions. The development of knowledge can be influenced by advances in the field of mathematics. Mathematics is one of the subjects tested at the school level. These subjects have an important role in education, especially its use in everyday life. The benefits of mathematics are not only providing numeracy skills, but also being able to improve thinking skills, especially the ability to analyze, synthesize, evaluate and solve problems in life (Nawawi, 2011; Sahroni, 2017; Omeri, 2015; Sundawan, 2016; Yayan & Anggraeni). , 2019).

Success in education cannot be separated from the learning process that involves educators and students. Steps to improve the quality of education are not only by improving the implementation of the learning process, but also need maximum effort in realizing satisfactory results by choosing a learning model. In mathematics, Indonesia is in the top ten of the lowest ranking of the world average in terms of national exam results. Based on this, especially schools located in Central Java occupy the 3rd position nationally but are still in the poor category because they are still below the average of 55 (permendikbud no 5 of 2015).

Low mathematics learning outcomessuggest that the average results of the National Examination (UN) may be influenced by several factors, both internal and external. Internal factors include motivation, intelligence, skills, beliefs, abilities, achievement, critical thinking and others, while external factors include educators, infrastructure, government policies, method selection, learning approaches or models, environment and family (Slamet, 2013: 54) . Based on the observations of researchers related to the UN (National Examination) for mathematics material, educators still have not applied the direct learning model, they are still using PBL (Problem Based Learning) which is recommended by the 2013 curriculum, one of which is the lack of understanding of the material for building flat sides when viewed from the UN. Innovative learning models are needed in every lesson.

Based on the results of initial observations with interviews, it can be concluded that a learning model is needed that can improve student learning outcomes, especially aspects of skills in learning mathematics. The skill aspect in question is the skill in processing, presenting, and reasoning in the concrete realm and the abstract realm in the flat-sided building material in solving problems of daily life (Permendikbud Number 24 of 2016). These skills aspects are very much needed by students in solving daily life problems that can be used in facing the challenges of the demographic bonus in 2045.

One of the efforts to overcome learning difficulties and increase success in learning is to apply a learning model that is in accordance with constructivism learning theory. Most constructivism has the idea of active learning in constructing knowledge. In addition, constructivism also views learning not only to receive information but also to develop it. Constructivism sees learning as an active process of students constructing meaning in both text and physical experience. The flipped learning model is a learning model that reverses

the cycle that usually occurs in classroom learning with independent learning outside the classroom using online content aspects of knowledge and discussion of more in-depth skills aspects in the classroom in accordance with constructivism theory. This is because the flipped learning model focuses on the level of knowledge aspects, namely C1, C2 and C3 when outside the classroom, while in the classroom students will be faced with skill aspect levels, namely C4, C5 and C6 so as to provide opportunities for students to solve problems that arise. faced individually and in groups both in terms of knowledge and skills (Alsowat, 2016:112; Bruning, 2004; Supardan, 2016; Waseso, 2018).

The flipped learning model is useful in training aspects of knowledge or aspects of students' skills in working on questions or solving problems in groups by communicating what is known to their friends when in class or outside of class (Shea and Bidjerano, 2010:1729). This communication is realized by discussing activities and answering questions orally, communicating openly and being able to accept suggestions and tips from friends, which is called Interpersonal Communication.

The flipped learning model is designed to work independently and in groups both directly in the classroom and online outside the classroom, educators provide knowledge and skills in delivering material with visualization both in class and outside the classroom, so that students know concrete objects, and can visualize material received so that it can be applied in everyday life. Knowing this, learning media is needed. Learning media are everything that can be used to channel messages and stimulate the teaching and learning process, both in the form of teaching aids, audio, video, applications, and software that can improve student learning outcomes (Aqib, 2013: 50). Japa, N., Suarjana, and Widiana (2017: 45) revealed that the GeoGebra media can improve students' mathematics learning outcomes on spatial material.

In addition to selecting an appropriate learning model, the use of learning media such as geoGebra is also important in achieving learning objectives. The GeoGebra-assisted Flipped Learning learning model is a learning model that positions students as active learning subjects equipped with the GeoGebra application. The learning model emphasizes individual or group collaboration. Geogebra-assisted flipped learning requires skills that are strong enough to be obtained outside the classroom and inside the classroom by paying attention and studying the material in the classroom so that students can take part in good learning. Geogebra-assisted flipped learning is effective in improving math skills learning outcomes because it involves students actively in the classroom. GeoGebra itself is influential in improving learning outcomes from several existing studies. GeoGebra-assisted flipped learning allows students to discuss and construct their existing thinking skills based on skills acquired from outside the classroom, be it videos, using the GeoGebra application individually or in groups. Geogebra assisted flipped learning is also better than flipped learning and control classes assisted. It's different with the learning model problem based learning PBL focused on solving problems (Suherman, 2020).

Eggen and Kauchak (2012:307) stated that the PBL learning model or better knownproblem based learninghas a learning focus on problem solving, responsibility in solving problems carried out by students, and educators as facilitators in supporting students to work on their problems. Students are required to be active to be able to solve problems given both individually. After the problem is obtained, students formulate the problem, after that the existing problems are then solved together by discussing with other students or educators.

II. Research Methods

The research chosen was a quasi-experimental research. This is because it is not possible for researchers to control all relevant variables that can affect learning outcomes in terms of mathematics knowledge and aspects of students' skills.The population in this study were students of class VIII SMPN / SMPT / SMP Satap in Kudus Regency while the sample in this study was students of SMPN / SMPT / SMP SATAP Kudus Regency class VIII even semester of the 2019/2020 school year, which consisted of three schools with different strata with three classes, each class being subjected to a different experimental model. In data collection methods include documentation, tests and questionnaires. While the instruments used include test instruments and questionnaires. In testing the instrument, it can be done with instrument analysts by checking the results of validity and reliability, while the instrument items can be done with differentiating power, difficulty, and internal consistency.

This study used a two-way multivariate analysis test with unequal cells with a 3×3 factorial design to determine the effect of two independent variables on the two dependent variables. The first independent variable is the next learning model symbolized by (A), namely the Geogebra-assisted Flipped Learning (FL) learning model symbolized by (A_1) hereinafter referred to as FLG which is applied to experiment one, the Flipped Learning (FL) learning model symbolized with (A_2) hereinafter referred to as FL which was applied to experiment two, and the Problem based learning (PBL) model symbolized by (A_3), hereinafter referred to as problem based learning (PBL) which was applied to the third experimental class. The second independent variable, namely the interpersonal communication of students is symbolized by (B) which consists of three categories, namely high (B_1), medium (B_2), low (B_3). The dependent variable is the result of learning mathematics from the aspect of knowledge symbolized by (X⟧_1), hereinafter referred to as P and the result of learning mathematics from the aspect of students' skills is symbolized by (X⟧_2), hereinafter referred to as K.

III. Results and Discussion

3.1 Results

Table 1. Univariate Normality Test Population Initial Ability Data

Sample	var. Bound	n	L_{obs}	$L_{\alpha;n}$	Test Decision
Geogebra-assisted Flipped Learning Model	Knowledge Aspect	92	0.084	0.092	H_0 not rejected
	Skill Aspect	92	0.060	0.092	H_0 not rejected
Flipped Learning Model	Knowledge Aspect	95	0.088	0.091	H_0 not rejected
	Skill Aspect	95	0.063	0.091	H_0 not rejected
Problem Based Learning Model	Knowledge Aspect	87	0.087	0.095	H_0 not rejected
	Skill Aspect	87	0.088	0.095	H_0 not rejected
High IC	Knowledge Aspect	90	0.087	0.092	H_0 not rejected
	Skill Aspect	90	0.059	0.093	H_0 not rejected
Medium IC	Knowledge Aspect	84	0.091	0.097	H_0 not rejected

	Skill Aspect	84	0.095	0.097	H_0 not rejected
Low IC	Knowledge Aspect	97	0.089	0.090	H_0 not rejected
	Skill Aspect	97	0.083	0.090	H_0 not rejected

Table 2. Population Multivariate Normality Test

Group	$\chi^2_{(0,05;2)}$	Percentage value $dj^2 \leq \chi^2_{(0,05;2)}$	Decision Test	Conclusion
FLG	5,991	99%	H_0 not rejected	Normal
FL	5,991	99%	H_0 not rejected	Normal
PBL	5,991	97%	H_0 not rejected	Normal
High IC	5,991	100%	H_0 not rejected	Normal
Medium IC	5,991	100%	H_0 not rejected	Normal
Low IC	5,991	100%	H_0 not rejected	Normal

Table 3. Homogeneity Test of Population Variance of Initial Ability Data

var. Bound	Data source	S_j^2	χ^2_{obs}	$\chi^2_{(0,05:2)}$	Test Decision
Knowledge Aspect	FLG	137,007	0.527	5,991	H_0 not rejected
	FL	159,147			
	PBL	137,007			
Skill aspect	FLG	169.924	1.005	5,991	H_0 not rejected
	FL	123,340			
	PBL	122,975			

Table 4. Homogeneity Test of Population Variance-Covariance Matrix of Initial Ability Data

Data source	S_i	χ^2_{obs}	$\chi^2_{(0,05:6)}$	Test Decision
FLG	$\begin{bmatrix} 144,15 & 74,62 \\ 74,62 & 134,25 \end{bmatrix}$	2,360	12,592	H_0 not rejected
FL	$\begin{bmatrix} 159,15 & 42,82 \\ 42,82 & 123,34 \end{bmatrix}$			
PBL	$\begin{bmatrix} 137,01 & 44,68 \\ 44,68 & 122,97 \end{bmatrix}$			
High IC	$\begin{bmatrix} 185,01 & 50,74 \\ 50,74 & 124,07 \end{bmatrix}$	2,800	12,592	H_0 not rejected
Medium IC	$\begin{bmatrix} 131,46 & 57,52 \\ 57,52 & 127,21 \end{bmatrix}$			
Low IC	$\begin{bmatrix} 127,11 & 54,40 \\ 54,40 & 130,98 \end{bmatrix}$			

Table 5. Summary of Two Pathway MANOVA with Dissimilar Cells

Source	SSCP Matrix	Λ	F_{obs}	F_{tabel}	Decision
Factor A: Learning Model	$\begin{bmatrix}21345,31 & 18126,40\\ 18126,40 & 15413,60\end{bmatrix}$	0.511	52,014	2,370	H_{0A} rejected
Factor B : Interpersonal communication	$\begin{bmatrix}13718,40 & 11400,70\\ 11400,70 & 9603,95\end{bmatrix}$	0.621	35,100	2,370	H_{0B} rejected

Source	SSCP Matrix	Λ	F_{obs}	F_{tabel}	Decision
AB (Interaction)	$\begin{bmatrix}308,707 & -16,2442\\ -16,2442 & 275,58\end{bmatrix}$	0.975	0.828	1,940	H_{0AB} not rejected
Residual (Error)	$\begin{bmatrix}31129,614 & 10525,426\\ 10525,426 & 24314,105\end{bmatrix}$				
Total (Corrected)	$\begin{bmatrix}49378,370 & 24113,719\\ 24113,719 & 36505,067\end{bmatrix}$				

Table 6. Summary of Post MANOVA Follow-up Test (Two Pathway ANOVA with Dissimilar Cells)

Dependent variable	Source	JK	dk	RK	F_{obs}	F_{α}	Decision
Knowledge Aspect	Factor A: Learning Model	15919.88	2	7959.94	91.14	3.03	H_{0A} rejected
	Factor B: Interpersonal communication	9721.32	2	4860.66	55.65	3.03	H_{0B} rejected
	Interaction (AB)	246.79	4	61.70	0.71	2.40	H_{0AB} not rejected
	Residual (Error)	22882.96	262.00	87.34			
	Total	48770.95	270.00				

Dependent variable	Source	JK	dk	RK	F_{obs}	F_{α}	Decision
Skill aspect	Factor A: Learning Model	10595.59	2.00	5297,80	74.57	3.03	H_{0A} rejected
	Factor B: Interpersonal communication	6334.99	2.00	3167.50	44.58	3.03	H_{0B} rejected
	Interaction (AB)	256.91	4.00	64.23	0.90	2.40	H_{0AB} not rejected
	Residual (Error)	18614.47	262.00	71.05			
	Total	35801.96	270.00				

Table 7. Marginal Inter-Mean Cells for Average Comparison Purposes

Learning model	Interpersonal communication test						Marginal Mean	
	Tall		Currently		Low			
	X_1	X_2	X_1	X_2	X_1	X_2	X_1	X_2

FLG	83.61	81.42	77,20	71.70	71.68	66.68	77.08	72.94
FL	75.88	71.31	69.65	65,88	60.14	59.86	68.84	65.87
PBL	66.57	62.93	59.14	57,00	49.60	53.20	58.23	57.60
Marginal Mean	75.65	72.18	67,90	64.27	61.40	60.47		

Table 8. Summary of Interline Double Comparison Test Results

Dependent variable	H_0	F_{obs}	$2F_{(0,05;2;261)}$	Test Decision
Knowledge Aspect	$\mu_{11\blacksquare} = \mu_{12\blacksquare}$	35.69	6.06	H_0rejected
	$\mu_{11\blacksquare} = \mu_{13\blacksquare}$	177.86	6.06	H_0rejected
	$\mu_{12\blacksquare} = \mu_{13\blacksquare}$	58,17	4.80	H_0rejected
Skill aspect	$\mu_{21\blacksquare} = \mu_{22\blacksquare}$	32.33	6.06	H_0rejected
	$\mu_{21\blacksquare} = \mu_{23\blacksquare}$	144.85	6.06	H_0rejected
	$\mu_{21\blacksquare} = \mu_{23\blacksquare}$	43.44	4.80	H_0rejected

Table 9. Summary of Inter-Column Multiple Comparison Test Results

Dependent variable	H_0	F_{obs}	$2F_{(0,05;2;261)}$	Test Decision
Knowledge Aspect	$\mu_{1\blacksquare1} = \mu_{1\blacksquare2}$	29.63	6.06	H_0rejected
	$\mu_{1\blacksquare1} = \mu_{1\blacksquare3}$	109.11	6.06	H_0rejected
	$\mu_{1\blacksquare2} = \mu_{1\blacksquare3}$	21.50	4.80	H_0 rejected
Skill aspect	$\mu_{2\blacksquare1} = \mu_{2\blacksquare2}$	41.32	6.06	H_0rejected
	$\mu_{2\blacksquare1} = \mu_{2\blacksquare3}$	83.13	6.06	H_0rejected
	$\mu_{2\blacksquare1} = \mu_{2\blacksquare3}$	9.00	4.80	H_0rejected

3.2 Discussion

a. First Research Hypothesis

Based on the results of the analysis on the MANOVA test, there are differences in the effects of the learning model on the knowledge aspect and the skill aspect. Because of these differences, it is necessary to carry out further tests after MANOVA with two-way ANOVA with unequal cells. The results of the two-way ANOVA test show that there is no interaction between the knowledge aspect of the learning model and interpersonal communication and there is no interaction between the skills aspect of the learning model and interpersonal communication. Furthermore, judging from the aspect of knowledge and aspects of good skills between the learning and interpersonal communication models, a double comparison test was conducted.

The results of the multiple comparison test concluded that in the Knowledge Aspect, the Flipped learning Geogebra (FLG) learning model provides better Knowledge Aspects than the Flipped learning (FL) learning model and the problem based learning (PBL) learning model, while the Flipped learning (FL) learning model provide better Knowledge Aspects than problem based learning (PBL). These findings are the same as the hypothesis proposed by the researcher.The difference between the findings and the proposed hypothesis lies in the influence of the learning model Flipped learningGeogebra (FLG) andflipped learning (FL) which has the same effect on the Knowledge Aspect. There are various factors that cause this to happen, one of which is that both models are problem-based learning models.

b. Second Research Hypothesis

The results of the multiple comparison test concluded that in terms of skills, the Flipped learning Geogebra (FLG) learning model provides the same skill aspects as the Flipped learning (FL) learning model and the Flipped learning Geogebra (FLG) learning model provides the same skill aspects as problem based learning. Flipped learning (FL) learning model provides a better skill aspect than direct. These findings are different from the hypothesis proposed by the researcher.The difference between the findings and the proposed hypothesis lies in the influence of the learning model Flipped learningGeogebra (FLG) and flipped learning (FL) which has the same effect on skill aspect and Flipped learning Geogebra (FLG) which gives the same effect as Problem based learning. There are various factors that cause this to happen, one of which is when learning these two learning models is a problem-based learning model.

Allegedly students find it difficult with the problems given. However, at the marginal average, it can be seen that students with problem posing learning models have a better average than other learning models. This is presumably because the problem posing learning steps have a positive impact on students who want to ask questions but are passive in class. According to Zakariya (2017), aspects of student skills are constrained by difficulties in learning mathematics. The emergence of several problems such as anxiety, phobias, and so on makes students become passive. Therefore, the problem posing learning model has a positive impact on passive students.

c. Third Research Hypothesis

Based on the results of the analysis on the two-way MANOVA test with unequal cells and the post-MANOVA follow-up test that has been carried out, states that there are differences in students' mathematical knowledge aspects at the interpersonal communication level. It can be seen from the manova test that students with high interpersonal communication have better knowledge aspects than students with moderate interpersonal communication, and better than students with low mathematical interpersonal communication. Students with moderate interpersonal communication have the same Knowledge Aspects with low interpersonal communication students. This is not in accordance with the hypothesis.

d. Fourth Research Hypothesis

Based on the results of the analysis on the two-way MANOVA test with unequal cells and the post-MANOVA follow-up test that has been carried out, it is stated that there are differences in aspects of student skills at the interpersonal communication level. It can be seen from the Manova test that students with high interpersonal communication have better skill aspects than students with moderate interpersonal communication, and better than students with low mathematical interpersonal communication. Students with moderate interpersonal communication have the same skill aspect as students with low interpersonal communication. This is not in accordance with the hypothesis.

e. The Fifth Research Hypothesis

Based on the results of the analysis of the two-way MANOVA test with unequal cells, it states that there is no interaction between the learning model and the level of interpersonal communication, so there is no need for further post-MANOVA testing. This means that the differences in Knowledge Aspects between high, medium, and low interpersonal communication in each learning model are the same as in general conclusions. If in general, in the learning modelFlipped learningGeogebra (FLG), students with high interpersonal communication have better Knowledge Aspects than students with

moderate and low interpersonal communication, while students with moderate interpersonal communication have Knowledge Aspects that are as good as students with low interpersonal communication.

Student group learning modelflipped learning (FL), students with high interpersonal communication have better Knowledge Aspects than students with moderate and low interpersonal communication, while students with moderate interpersonal communication have the same Knowledge Aspects with low interpersonal communication students Group students with problem based learning models, students with High interpersonal communication has better Knowledge Aspects than students with moderate and low interpersonal communication, while students with moderate interpersonal communication have Knowledge Aspects that are as good as low interpersonal communication students, then specifically on each learning model the same applies to general conclusions the.

f. The Sixth Research Hypothesis

Based on the results of the analysis on the two-way MANOVA test with unequal cells, it states that there is no interaction between the learning model and the level of interpersonal communication, so there is no need for further post-MANOVA testing. This means that the differences in skills aspects between high, medium, and low interpersonal communication in each learning model are the same as in general conclusions. If in general, in the learning modelFlipped learningGeogebra (FLG), students with high interpersonal communication have better skill aspects than students with moderate and low interpersonal communication, while students with moderate interpersonal communication have the same skill aspect as low interpersonal communication students.

In the Flipped learning (FL) learning model, students with high interpersonal communication have better skill aspects than students with moderate and low interpersonal communication, while students with moderate interpersonal communication have the same skill aspect as low interpersonal communication students. In the Problem based learning learning model, students with high interpersonal communication have better skill aspects than students with moderate and low interpersonal communication, while students with moderate interpersonal communication have the same skill aspect as low interpersonal communication students. -each learning model applies the same as the general conclusion.

g. Seventh Research Hypothesis

Based on the results of the analysis on the two-way MANOVA test with unequal cells, it states that there is no interaction between the learning model and the level of interpersonal communication, so there is no need for further post-MANOVA testing. This means the knowledge aspect difference between learning modelsFlipped learningGeogebra (FLG),flipped learning(FL), and Problem based learning at each level of interpersonal communication is the same as in general conclusions. In general, for students with high interpersonal communication, the learning modelFlipped learningGeogebra (FLG) provides Knowledge Aspects that are as good as the learning model flipped learning (FL) but better than problem based learning, while the learning model flipped learning (FL) provides better Knowledge Aspects than problem based learning.

For students with moderate interpersonal communication, the learning model Flipped learningGeogebra (FLG) provides Knowledge Aspects that are as good as the learning model flipped learning (FL) but better than problem based learning, while the learning model flipped learning (FL) provides better Knowledge Aspects than problem based learning. For students with low interpersonal communication, the learning model Flipped learning Geogebra (FLG) provides Knowledge Aspects that are as good as the learning model flipped learning (FL) but better than problem based learning, while the learning

model flipped learning (FL) provides better Knowledge Aspects than problem based learning, so specifically at each level of interpersonal communication the same applies to the general conclusion.

h. Eighth Research Hypothesis

Based on the results of the analysis of the two-way MANOVA test with unequal cells, it states that there is no interaction between the learning model and the level of interpersonal communication, so there is no need for further post-MANOVA testing. This means that there are differences in skill aspects between learning modelsFlipped learningGeogebra (FLG), flipped learning (FL), and Problem based learning at each level of interpersonal communication is the same as in general conclusions. In general, for students with high interpersonal communication, the learning modelFlipped learningGeogebra (FLG) provides the same skill aspect as the learning modelflipped learning (FL) and Problem based learning, while the learning modelflipped learning (FL) provides a better skill aspect than Problem based learning.

For students with moderate interpersonal communication, the learning model Flipped learning Geogebra (FLG) provides the same skill aspect as the learning model flipped learning (FL) and Problem based learning, while the learning modelFlipped learning (FL) provides a better skill aspect than Problem based learning. For students with low interpersonal communication, the learning modelFlipped learningGeogebra (FLG) provides the same skill aspect as the learning modelflipped learning(FL) and Problem based learning, while the learning modelflipped learning(FL) provides a better skill aspect than Problem based learning, so specifically at each level of interpersonal communication the same applies to the general conclusion.

IV. Conclusion

Based on the results of the research and discussion above, conclusions can be drawn in this study as follows, 1) there is an aspect of knowledge, the Flipped learning Geogebra (FLG) learning model provides better knowledge aspects than the Flipped learning (FL) learning model and the problem based learning model. (PBL). Flipped learning (FL) learning model provides better knowledge aspects than problem based learning (PBL). Meanwhile, in the aspect of skills, the Flipped learning Geogebra (FLG) learning model provides a better skill aspect than the Flipped learning (FL) learning model and the problem based learning (PBL) learning model. Flipped learning (FL) learning model provides better skill aspects than problem based learning (PBL); 2) in the aspect of knowledge, high interpersonal communication has better knowledge aspects than students with moderate interpersonal communication and low interpersonal communication. Students with moderate interpersonal communication have better aspects of knowledge than students with low interpersonal communication.

Whereas in the aspect of skills, students with high interpersonal communication have better skill aspects than students with moderate interpersonal communication and low interpersonal communication. Students with moderate interpersonal communication have better skill aspects than students with low interpersonal communication; 3) (a) In the Flipped learning Geogebra (FLG) learning model, students with High interpersonal communication has better knowledge aspects than students with moderate interpersonal communication and low interpersonal communication. Students with moderate interpersonal communication have better aspects of knowledge than students with low interpersonal communication. (b) In the Flipped learning (FL) learning model, studentswithHigh interpersonal communication has better knowledge aspects than students

with moderate interpersonal communication and low interpersonal communication. Students with moderate interpersonal communication have better aspects of knowledge than students with low interpersonal communication. (c) In the problem based learning (PBL) learning model, students with High interpersonal communication has better knowledge aspects than students with moderate interpersonal communication and low interpersonal communication. Students with moderate interpersonal communication have better aspects of knowledge than students with low interpersonal communication.

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