Vol. 7, No. 2, May 2019

p-ISSN: 2338-8617
e-ISSN: 2443-2067

Jurnal Ilmiah

PEURADEUN

JIP
The International Journal of Social Sciences
www.journal.scadindependent.org
DOI Prefix Number: 10.26811

ACCREDITED "B" by the Ministry of Ristekdikti
from October 30, 2017 until October 30, 2022

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Jurnal Ilmiah Peuradeun
The International Journal of Social Sciences
P-ISSN: 2338-8617
E-ISSN: 2443-2067
International Journal
Open Access
Peer-Reviewed

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JURNAL ILMIAH PEURADEUN
The International Journal of Social Sciences
p-ISSN: 2338-8617/ e-ISSN: 2443-2067

www.journal.scadindependent.org

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Article *in* Jurnal Ilmiah Peuradeun
Available at : http://journal.scadindependent.org/index.php/jipeuradeun/article/view/301
DOI : http://dx.doi.org/10.26811/peuradeun.v7i2.301

Jurnal Ilmiah Peuradeun
The International Journal of Social Sciences
doi: 10.26811/peuradeun.v7i2.301

Jurnal Ilmiah Peuradeun
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EXPERIMENTATION OF PROBLEM POSING LEARNING MODEL ASSISTED OF AUTOGRAPH SOFTWARE TO STUDENTS' MATHEMATICAL COMMUNICATION ABILITY IN TERMS OF STUDENT'S GENDER

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Received: May 20, 2018 **Accepted:** Sept 28, 2018 **Published:** May 30, 2019
Article Url: https://journal.scadindependent.org/index.php/jipeuradeun/article/view/301

Abstract

The study aimed at finding out in dept about the interaction between Problem Posing model assisted with Autograph Software with the student's gender to students' mathematical communication ability. This study used quantitative research with quasi experimental method. The approach used was a scientific one. The population of this study were all the Class X students of MAN Kisaran. The sample in this study were the students of class X-IPA1 and X-IPA-2 in MAN Kisaran of Asahan Regency. This study was conducted in the even semester of the academic year 2017/2018. Data analysis was done by 2-way ANOVA test. Based on the statistical calculation, it can be concluded that the value of Fcount<Ftable is 0.778 <3.12. This shows that Fcount<Ftable(0.778 <3.12) is not significant so that it can be concluded that H0 is accepted and Ha is rejected which means there is no interaction between learning with students' gender. The finding of students' actitivity aspects is based on direct observation. Female students are more active in learning but are weaker in reasoning, meanwhile Male ones are quick in reasoning but are less active in learning.

Keywords: *Problem Posing; Interaction; Mathematical Communication; Autograph Software*

A. Introduction

The National Council of Teachers Mathematics (NCTM, 2000: 4) has established several process standards that learners must master in learning mathematics, including: (1) problem solving; (2) reasoning and proof; (3) communication; (4) connection; (5) representations. It is clear that one of the standard processes that learners have to master is the ability of mathematical communication. Through learning mathematics the way of the learners' thinking is expected to develop well because mathematics has strong structure and clear interconnection among existing concepts that enable to improve students' mathematical communication ability.

Brenner (1998) improving students' mathematical communication ability is one of the common goals of the mathematical reform movement. This opinion hints the importance of communication in learning mathematics. Through communication, students can convey their ideas to teachers and to other students. The mathematical communication ability is the ability of students to be able to speak, write, explain mathematical ideas and encourage the interaction and exploration of students' ideas in the classroom through group discussion and students' ability to communicate math as the message content to be conveyed (NCTM 2000: 4) .

Schleppegrell and Bowman (1995) state that to renew the curriculum, problem posing can be effectively applied to students for discussion because in this method the teachers identified student interests, posed problems for discussion, and the langauge used from the one generated by the discussions to develop language learning activities. In difficult teaching circumstances like in resource-poor educational environments, problem posing becomes a first step in making a new curriculum more responsive to student interests and needs. A pedagogically sound sequence of presentations of linguistic structures and vocabulary can be developed when posing problems is done because it generates discourse-level communication in the classroom.

One of the efforts that can be made to meet that goal is with a mathematics education program, which can substantially encourage the development of students' mathematical communication ability. In addition, for a teacher, in teaching mathematics is not enough just rely on mastery of the material. It requires appropriate strategies and learning model so that students feel happy and eager to learn math, so students can achieve high achievement. As an alternative can be applied Problem posing learning model defined as the making of new problems by students based on the problems that have been resolved.

Silver et. al., (1996) in his research found that the mathematical problem-solving approach was an activity with two different meanings: the process of developing new mathematical problems by the students based on the existing situation and the process of re-formulating the mathematical problems in their own words based on the situation given. Thus, the mathematical problem posed by the student refers to the situation prepared by the teacher.

Akay (2010) problem posing helps students to gain control of others (eg teachers) and at the same time encourages them to create new ideas by giving them a broader view of what can be done with problems (Brown & Walter, 1983). This process can also help the teacher because the posing problem opens the window to students' thinking (Silver, 1994). In this way, teachers can well understand students' cognitive processes; find out about possible misunderstandings at the beginning of the learning process and gather information about students' achievement levels (Silver et al., 1990). As a consequence their study program can be tailored to the individual needs of students designed to improve learning (Dickerson, 1999). The application of mathematical problems according to Brown and Walter (1990) consists of 2 important aspects, namely accepting and challenging. Accepting is related to the students' ability to understand the situation given by the teacher or the predetermined situation. While challenging, relates to the extent to which students feel challenged from the given situation to give birth to the ability to issue problems or math

problems. This means that submission of mathematical problems can help students to develop their logic processes.

Scientific Approach is used in this research as the learning approach. Roheni et al (2017) state that the students' ability in solving mathematical problems taught by using Scientific Approach are differ from those taught by using Direct Instruction. Mutholib et al (2017) said that the educators have to believe that Sientific Approach is important in enhanching students' communication skill. Communication skill can be proper to meet the teachers' expectation in the target of language, namely attaining the students' communicative competence.

The use of Information Communication and Tehnology (ICT) today is growing very rapidly. These developments also impact on education in general and learning in particular. In this case teachers and students are required to be able to compensate for progress in the ICT. Teachers must be able to use the media or software in the learning process.

Autograph software is a special program used in learning mathematics. Autograph has 2D and 3D graphics capabilities for topics such as transformation, parts cone, vectors, slope, and derivatives.

Problem Posing assisted with Autograph Software is expected to be more helpful for students to find solutions to problems faced in math lessons. Technology is an important tool for teaching and learning mathematics. Technology should be an alternative tool of the many tools available to help children learn math (NCTM 2000). Therefore, it is expected that IT / ICT based learning can be done more easily.The use of ICT is one of the six principles of school mathematics (NCTM, 2000), "Technology is essential in teaching and learning mathematics; it means that technology is an important tool for teaching and learning mathematics, it affects the mathematics that are taught and improves student learning.

In addition to learning model factors, gender factors also affect the learning outcomes of mathematics. Female students tend to have low motivation in learning mathematics than male students. It is influenced by the right male brain hemisphere possesses a stronger ability in the numerical and logical fields than the right female hemisphere, whereas

the left hemisphere of the female student has advantage in aesthetic and religious over the left hemisphere of men (Word, dkk: 2013). It is a basic assest for boys to develop skills in the field of mathematics.

Gender differences in learning math attract the attention of many researchers published in (Casey, et al: 2001: 58) conclude that "learning is affected by many factors: personal, situational and cultural". Therefore, the personality factors of the situation and culture have influence in learning outcomes then it is an important thing to know as far as these factors affect the results of learning. One whose diagram is related to personality is gender.

This paper aims to explain the influence of gender and model of learning on the ability of math communication on the students of MAN Kisaran and to explain is there an interaction between the learning model and the gender toward the increase in mathematical communication of MAN kisaran.

B. Method

This research is quantitative research with experimental method in the form of quasi experiment and research design used is factorial design 2 X 2. The first factor is gender with 2 variables that is male and female. While the second factor is with the learning model with two variables that is problem posing learning model assisted with autograph software with conventional learning model. The approach used was a scientific one. The scientific learning is a learning adopting scientific steps in developing knowledge through scientific method. In learning process, it involves 3 aspects: affective, cognitive, and psycomotor. The affective aspects involve substance tranformation or learning material in order that the students "know why". The psycomotoric aspects involve substance or learning material in order that the students "know how". Meanwhile the cognitive ones involve substance transformation or learning material in order that the students "know what". The population of this study were all the class X students of MAN Kisaran. The sample in this study were the students of class X-IPA1 and X-IPA-2 in MAN Kisaran of Asahan regency. This study was conducted in the even semester of the academic year 2017/2018. In X-

IPA-1 were 11 male students and 25 female students, and in X-IPA-2 class were 9 male students and 27 female students.

Data collection was done by using test technique. The test used in this study was a test of students' mathematical communication ability. Furthermore, to test the hypothesis using anava two lanes with the help of SPSS 21.

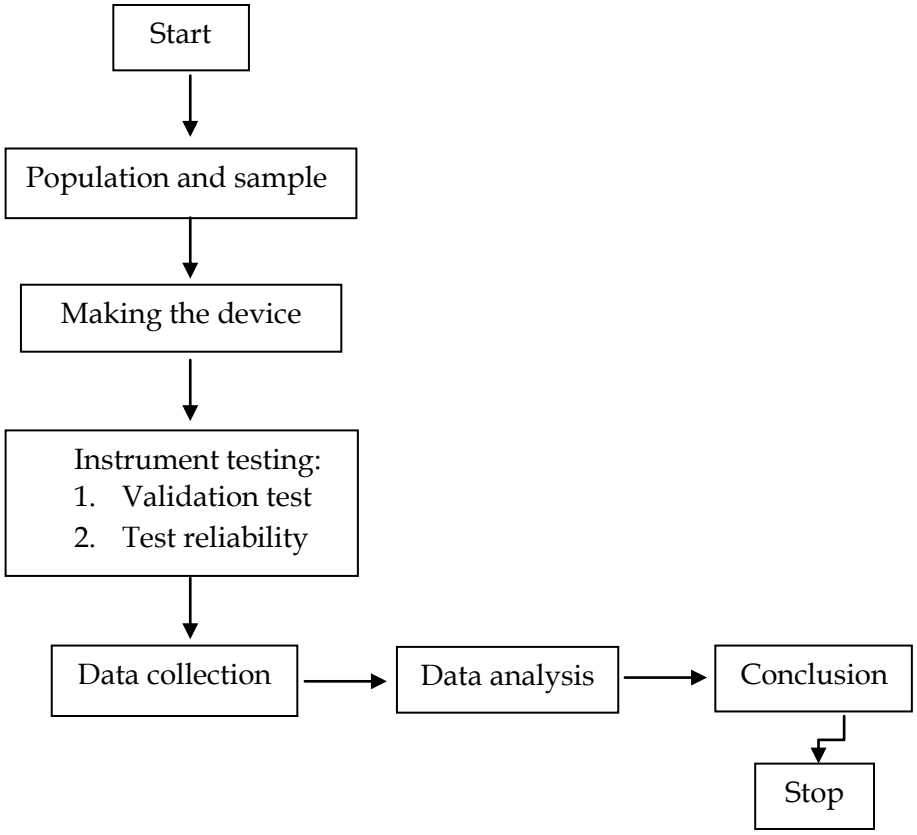

Diagram 1
Flow Chart of Research

C. Research Finding

Data of test result of mathematical communication ability was obtained through written test in the form of essay as many as 5 items. In this study that must be measured is the mathematical communication ability of students who follow the learning model. The output of ANAVA results two factorial design lines that can be used to present the hypothesis.

The results of descriptive analysis toward the data of mathematical communication ability data of the students of both learning groups (Problem Posing and conventional) based on gender category (male and female) are presented in table 1 below:

Table 1: The Descriptive Analysis Result of Data of Students' Mathematical Communication Ability based on Gender Category

Gender category	Statistic	Learning Model					
		Problem Posing + softwareAutograph			Conventional		
		Pre-test	Post-test	N-gain	Pre-test	Post-test	N-gain
Male	N	11	11	11	9	9	9
	Average	9,54	30,45	0,53	5,44	20,55	0,34
	Deviation standard	7,5	17,96	0,36	2,65	11,95	0,25
Female	N	25	25	25	27	27	27
	Average	9,52	36,4	0,66	9,48	23,51	0,33
	Deviation standard	5,9	11,18	0,25	7,63	11,35	0,29

Based on table 1 above, it is found that there is improvement of communication ability of students' problem taught with problem posing assisted with autograph software with average value and standard deviation for male gender category with N-Gain value equal to 0,53 and 0,36, category female's gender with N-Gain of 0.66 and 0.25, while for the improvement of students mathematical communication ability taught conventionally had mean value and standard deviation for male gender category with N-Gain value of 0.34 and 0.25, female gender category with N-Gain of 0.33 and 0.29.

The Average of the increasing in students' mathematical communication ability taught by problem posing and conventional learning for male and female gender included in medium N-Gain category (0,3 <g <0,7).

For more details, improvement of students' mathematics communication (N-Gain) based on problem posing asisted with autograph software for gender category is presented in table 2. below:

Table 2. Description of N-Gain with Gender Category

	N-Gain Value				
	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
				Lower Bound	Upper Bound
Male	,5382	,36080	,10879	,2958	,7806
Female	,6648	,25835	,05167	,5582	,7714

Based on the average score of N-Gain score of students' mathematical communication ability in table 2 shows that the average score of mathematical communication ability of male students is 0,5382 and for female students is 0,6648. This shows that the average score of male students' mathematical communication test score is lower than the average score of mathematical communication ability test for female students.

Table 3. Descriptive of N-Gain From Learning Model

Learning Model	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Problem posing+ Autograph	36	,6261	,29404	,04901	,5266	,7256
Conventional	36	,3353	,28065	,04677	,2403	,4302
Total	72	,4807	,32077	,03780	,4053	,5561

Based on the average score of N-Gain score of students' mathematical communication ability in table 3 it can be seen that the average score of students' mathematical communication ability through the problem posing model assisted with an autograph sotware is 0.6261 and taught by conventional learning model is 0.3353. It shows that the average score of the students 'mathematical communication ability test through the problem-posing model assisted with autograph is higher than the average score of students' mathematical communication ability test

through conventional learning model. Interaction Testing of the calculation results are presented in Table 4. as follows:

Table 4. Gender Interaction with Learning Model

Dependent Variable: N-Gain Value

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	1,645[a]	3	,548	6,589	,001
Intercept	12,631	1	12,631	151,752	,000
Learning Model	1,001	1	1,001	12,027	,001
Gender	,051	1	,051	,608	,438
Learning Model * Gender	,065	1	,065	,778	,038
Error	5,660	68	,083		
Total	23,942	72			
Corrected Total	7,305	71			

a. R Squared = ,225 (Adjusted R Squared = ,191)

It can concluded that the value of $F_{count}<F_{table}$ is 0.778 <3.12. This shows that $F_{count}<F_{table}$(0.778 <3.12) is not significant so it can be concluded that H0 stated that there is no interaction between the learning with student's gender is accepted which means Ha is rejected (there is no interaction between learning with student's gender). More clearly the interaction can be seen in the graph below:

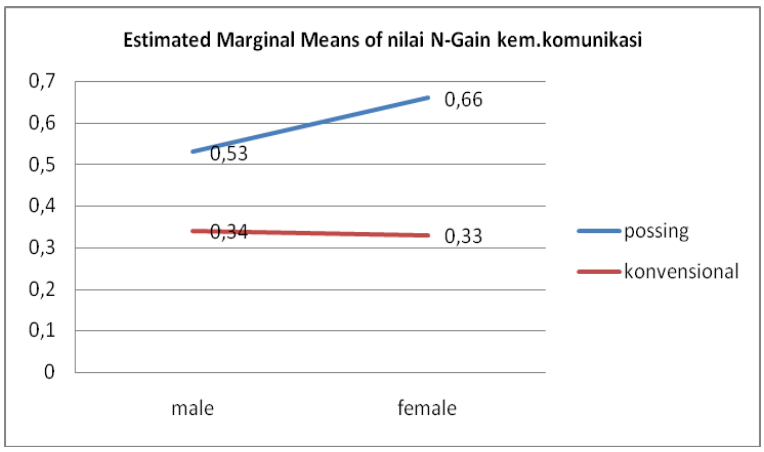

Figure 1 Graph of Interaction of Learning Factors with Students'

p-ISSN: 2338-8617
e-ISSN: 2443-2067

Based on figure 1 above shows that the average increase of N-Gain students' mathematical communication ability taught by problem posing assisted with an autograph software for gender category of male is 0,53 and female is 0,66 that is higher when compared with students taught by conventional learning for male gender category by 0,34, and female gender category equal to 0,33. The difference of the average of the improvement of mathematical communication ability between the students taught by problem posing assisted with an autograph software and conventional learning for students with male gender equal to 0,19, and female gender equal to 0,33. Based on the difference in average increase, it appears that students with female gender get benefit greatly taught by problem posing assisted with an autograph software which is the difference of 0.33 meanwhile for difference of male gender average equal to 0,19.

D. Discussion

In addition to the findings result above, the researcher also got some findings of students' activity aspects based on direct observation. The female students were more active in learning but weak in reasoning meanwhile male ones were quick in reasoning but less active in reasoning. This is caused the male students will be interested in when the learning is more focused on technology especially a computer-based one. Male students' reasoning ability are more excellent than female when oriented to practice directly, one of them in the practice of magic finger. It is supported by the previous study from Purwanti (2013) stating male students' ability was higher than female's seen from the proficiency in using fingers and in finishing the question relating to addition operation and reduction up to 99 without storage.

There is different motoric between male and female, which male is more developing rude motoric with the testeron influence meanwhile female is more in the development of smooth motoric. This underlies male trait tend to be rude and female is more genteel.

E. Conclusion

It is concluded that $F_{count}<F_{table}$ (0.778 <3.12) is not significant so it can be concluded that accepted H0 which states there is no interaction between learning with student's gender which means Ha is rejected. This means that students with female gender can be more improved when they are taught by problem posing model assisted with an autograph software. From the result of the average increase and the difference of the average of the improvement of students 'mathematical communication ability showed that the interaction between the learning model and the gender, gave a significant joint effect on the improvement of students' mathematical communication ability. The the result of the experiment showed that the students were more active and gave more positive response to the class taught by get problems posing assisted with an autograph software than by conventional learning.

Those who want to follow up this study, the researcher suggests that the study is focused on the other aspects except gender such as economy, students' intelligence, and students' previous math ability.

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