The Influences of Three-Steps Interview Model in Generating Conjenture Analytics for SMP Students□

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Abstract— This study investigated the cooperative teaching-learning influences of three-step interview model in generating conjecture analytics for SMP students. The study applied a quasi-experimental model with randomized control group pretest-posttest design. The population is the sum of the seventh-grade students of SMP. The samples, the 33rd students of VII-J as an experimental class and the 33rd students of VII-G as control class, are selected through simple random sampling. The data were analyzed by linear regression and t_{test}. The result of the study projected the mean of 38, 39 of an experimental class, and 34, 91 of the control class. Then, the result of regression equation $\hat{Y} = 21{,}558 + 0{,}366X$, with $t_{test} = 2{,}004$ and $t_{table} = 1{,}998$ on the significant level $α = 0, 05$, it formulated $t_{test} > t_{table}$, $2{,}004 > 1{,}998$. In conclusion, the study postulated that the cooperative teaching-learning of three-steps interview model influences in generating conjecture analytics for SMP students estimated on 12, 9 %.

Index Terms — Conjecture, CTL Model, Three-Step Interview

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1 INTRODUCTION

MATHEMATICS is one subject of tested lessons on *Ujian Nasional* (UN) as nation standard for examination to enter the next school level unit and educational system enhancement. The objectives of mathematics, according to PEMENDIKNAS, improve students' ability in communicating ideas on mathematics symbols, tables, diagrams, and problems solving. Communication in mathematics is the students' ability to communicate their ideas in problem-solving by active participation for questions –answer in the classroom process.

Communication is essential in a mathematics lesson, which the students learn to interact, cooperate, and communicate one to another, yet, also with the teacher (Marali, 2013). Socially, the communication ability is the actual activity of talking and thinking, which are recommended to be enhanced by educational expertise. In Mathematical Communication, the ability to generate conjecture analytics is one of the indicators to be measured. In addition, according to the National Council of Teachers of Mathematics (NCTM), generating conjecture analytics is the standard of mathematics curriculum as mean as communication for the 5th to 8th SMP grade layer.

The students' ability to generate conjecture analytics is defined as the ability to formulate hypothetic sentence ideas by considering attached information or problems with degenerate positive orientation (Permatasari, 2016). Norton, in Permatasari research, stated that conjecture analytics are formulated from the experiences values, and related to consciousness and persistence. It signified students' awareness about the problem analytic and solution. Moreover, according to International studies about Mathematics Literacy, the Program for International Student Assessment (PISA), Indonesia has followed the PISA events; 2000, 2003, 2006, 2009, and 2012. Indonesia was ranked the second-bottom of 56 countries in the world with the acquisition of a score of 375. PISA specifically focuses on

analyze, justify, and communicate ideas effectively, formulate and solve and interpret mathematical problems as ability. Those focuses are the indicators for students' mathematical communication skills in generating conjecture analytics.

In communicative teaching-learning (CTL) model, to generate conjecture, the students should be involved within the mathematics process. It fosters students' confidence to solve mathematical equations in learning. Within this model, a three-step interview is taken as the effects of the treatment. The three-step interview model was developed by a researcher named Spencer Kagan in early 1990 (Kagan, 1990). This learning model consists of three phases of activity, namely interviews-reports. It prioritizes students because each student is given a stimulus and flexibility to develop the ability to make a conjecture in writing and present it to classmates.

Based on the above, the purpose of this study was to determine how much influence cooperative learning model Three-Step Interview on the ability to make a conjecture of junior high school students.

2 REVIEW OF LITERATURE

2.1 Conjecture Analytics Capability

The capability of generating conjecture analytics is defined as problem-solution hypothetical sentences constructions (Permatasari, 2016). Norton, in Permatasari research, stated that conjecture analytics are formulated from the experiences values, and related to consciousness and persistency (Permatasari, 2016). It covered observation, investigation, exploration, experimentation, and inquiry for the mathematical field.

2.2 Three-Steps Interview in CTL

In CTL, the *Three-Steps Interview* model is familiar learning model in the teaching-learning process. However, in Mathe-

matical inquiry, it has not been too often discussed in generating conjecture analytics, particularly, for the small number of related studies to this model, influencing research, effectiveness, and its comparison to other learning models. The Three-Step Interview was developed by a researcher named Spencer Kagan in early 1990 (Kagan, 1990). This learning model consists of three phases of activities, namely interviews-reports. The following steps are described as follow:

1) Teacher express purpose of learning and divide students into several groups are heterogeneous, within each group consisted of four students, paired one to another.

2) Teacher gives a glimpse of the material scale, and then shares the questions and asks the students to split the question as to individual responsibility and give a moment before the discussion begins.

3) The Students discuss in pairs and act as interviewers and interviewees in solving problems. Once the allotted time is finished, the next pair switches roles.

4) Students understand and resume the explanation of each partner. The teacher asks each partner in a group discussion, each conveying, and responds to information obtained from the partner.

5) Students submit the information obtained from each partner in front of the class and then another group responding to one another. Teacher as facilitator discuss the results of discussions and convey concepts acquired in learning.

6) Teachers provide an evaluation of the material that has been discussed and take into account together.

2.3 The Application of Three-Steps Interview Model Type on the Capability to generate conjecture on Materials Scale

The Three-Steps Interview is one of Cooperative Teaching Learning (CTL) model that prioritizes students in giving a stimulus and flexibility to develop the capability to generate conjecture on writing-tasks, then, submits it to the classmate. Within this study, it applied to scale subject materials.

The scale subject materials contents consist of conjectures elements: estimates, finding solutions, and its applications. These elements indicated the construction of a serial set to formulate the conjecture. The students learn how to estimate about right or wrong within postulated sentences as means as mathematical communication inquiry. The possibility to find the right solution and use a method or formula student has learned before. The sample is as follow:

A pioneer Indonesian N-219 aircraft was made in PT. *Dirgantara* Indonesia sized wingspan of 19.5 meters long and 6.1 meters high. If the company makes the miniature scale of 1: 150, it would determine, as follow:

a. Is the length and height of aircraft miniature between 13 cm and 4.06 cm?

b. How did the length and height of the miniature wing aircraft measure?

c. Apply to proper calculation formula for the length and height of the miniature aircraft?

Answer:

a. Yes, the length and height of miniature aircraft wings is 13 cm and 4.06 cm.

b. the length of the wing miniature aircraft is coded as p and t is the height of the wings miniature aircraft, then the length and height of the wing miniature aircraft can be calculated as follows:

$$\text{Scale} = \frac{\text{The height of Aircraft Wings}}{\text{The Leght of Aircraft Wings}} \text{ and}$$

$$\text{scale} = \frac{\text{The height of Aircraft Wings miniature}}{\text{The Leght of Aircraft Wings miniature}}$$

a. Moreover, the length of the aircraft wing is 19.5 m or 1950 cm and the height of the plane's wings is 6.1 m or 610 cm. For example, *p* is the length of a miniature wing aircraft and *t* is a miniature high-wing plane, then the miniature aircraft wing length can be calculated by using a formula:

$$\text{Scale} = \frac{\text{The leght of Aircraft Wings miniature}}{\text{The Leght of Aircraft Wings}}$$

$$\frac{1}{150} = \frac{p}{1950 \text{ cm}}$$

$$150p = 1950 \text{ cm}$$

$$p = \frac{1950 \text{ cm}}{150}$$

$$p = 13 \text{ cm}.$$

To measure the height of aircraft miniatures:

$$\text{Scale} = \frac{\text{The height of Aircraft Wings miniature}}{\text{The height of Aircraft Wings}}$$

$$\frac{1}{150} = \frac{t}{610 \text{ cm}}$$

$$150t = 610 \text{ cm}$$

$$t = \frac{410 \text{ cm}}{150}$$

$$t = 4{,}06 \text{ cm}$$

In Conclusion, the height and length of aircraft miniature are 13 cm and 4, 06 cm.

3 RESEARCH METHOD

The objective of the study was to investigate the influences of the three-steps interview model in generating conjecture analytic for junior high school layer. The study was designed within a randomized control group pretest-posttest. Then, the study manipulated the samples within a three-step interview, as part of the CTL model. Then, the variables are a three-step interview (independent variable) and generating conjecture analytic (dependent variable). The population of the study was the sum of 10 classes at SMP N 1 Langsa. Then, the samples, the 33rd students of VII-J as an experimental class and the 33rd students of VII-G as control class, are selected through simple random sampling. To collect the data, the study instruments are composing the tested (pre-test and post-test) simulation within classroom applications. The instruments also were codified invalidity and reliability to be carried

out the research objectives.

4 FINDINGS AND DISCUSSION

The finding projected the equations result of (1). The normality and homogeneity distribution of data, (2). Linear Regression and (3). The examination of hypothesis testing.

(1) The normality and homogeneity distribution tested whether the pre-test comes from the normally distributed population or not. The data normality in the experimental and control class pre-test is executed on the Chi-square significance level of 5%.

Table 4.1. The table of normality test distribution between the experimental and control class pre-test result

Classes	N	χ^2_{count} $\alpha = 5\%$	χ^2_{table}	Conclusion
Experimental	33	8,585	9,4877	The Data is normally distributed
Control	33	7,380	12,591	

Considering to the normality test distribution above, the experimental class projected $\chi^2_{count} = 8,585$ $\chi^2_{count} = 8,585$, and $\chi^2_{table} = 9,4877$. Then, $(\chi^2_{count} < \chi^2_{table}) = (\chi^2_{count} < \chi^2_{table}) = 8,585 < 9,4877$ $(8,585 < 12,592)$. It can be concluded that the students' capability to generate conjecture analytics in experimental class is normally distributed. It was similar occurred to control class distributions. The result projected $\chi^2_{count} = 7,380 (\chi^2_{count} < \chi^2_{table}) = 7,380 < 12,591$. In conclusion, both classes' data were normally distributed. Furthermore, to find out the variances of homogeneity for both classes, the test was conducted.

Table 4.2. The Homogeneity Test Distribution between the experimental and control class pre-test result

Classes	N	F_{count}	F_{table}	Conclusion
Experimental	33	1,6621, 662	3,991 ,804	The Variant of Classes are Homogeny
Control	33			

The Table above projected the result of homogeneity test for both classes, experimental and control. The result indicated $F_{count} = 1,662$ for the F distribution value, i.e. $F_{count} = 1,662$ and $F_{table} = 1,804$. As indications,

$(F_{count} < F_{table}) = (1,662 < 3,99)$ $(F_{count} < F_{table}) = 1,662 < 1,804$, then, if H_o it is accepted, the variant of classes will be homogeny.

To investigate the influences of a three-step interview in generating conjecture analytics, the post-tests were conducted with Chi-squared significance level of 5%.

Table 4.3. The Normality Test between the experimental and control class pre-test result

Classes	N	χ^2_{count}	χ^2_{table} $\alpha = 5\%$	Conclusion
Experimental	33	8,969	12,592	The Data is normally distributed
Control	33	1,641	15,507	

The table above projected the result of normality test, $\chi^2_{count} = 8,969$ with 33 samples and $\alpha = 5\%$, it estimated $\chi^2_{table} = 12,592$. Then, $(\chi^2_{count} < \chi^2_{table}) = (8,969 < 12,592)$ Thus, the post-test score capability of conjecture generating for an experimental class was normally distributed. It was occurred similar for control class, the result of the normality test $\chi^2_{hitung} = 1,641$, with 33 samples and $\alpha = 5\%$, it estimated $\chi^2_{tabel} = 15,507$. Then, $(\chi^2_{hitung} < \chi^2_{tabel}) = (1,641 < 15,507)$

In conclusion, the post-test score capability of conjecture generating for control class was normally distributed. Furthermore, to find out the post-test variances of homogeneity for both classes, the test was conducted.

Table 4.4. The Homogeneity Test Distribution between the experimental and control class post-test result

Classes	N	F_{count}	F_{table}	Conclusion
Experimental	33			The Variant of Classes are Homogeny
Control	36	1,088	3,99	

The table projected the homogeneity test distribution between the experimental and control class post-test result. The result estimated experimental class Variant $= 147,37$ and the control class variants $= 135,46$. Then, the $F_{score} = 1,088$. Within the table the F_{table}, on $\alpha = 5\%$, the coefficient of quantifier = 1, and the coefficient of denominator = 64, it was esti-

mated$F_{table} = 3,99$. In short, $(F_{count} < F_{table}) = (1,088 < 3,99)$ if H_o it is accepted, the variant of classes will be homogeny.

(2) The linear regression test was conducted through Statistical Product and Service Solutions (SPSS) 20.0 version. The result is projected as follow:

Table 4.5. The Linear Regression Distribution Data

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	21.558	6.812		3.165	.003
	X	.366	.171	.360	2.145	.040

a. Dependent Variable: Y

According to the above table, it projected the x and y variable acquired (a) constant 21, 558 and regression coefficient (b) 0, 366, by $\hat{Y} = 21,558 + 0,366X$ an equation. To identify the percentage (%) of influenced variables, independent to dependents, it was attached bellow table:

Table 4.6. Determinant Coefficient

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.360^a	.129	.101	12.10423

a. Predictors: (Constant), X

b. Dependent Variable: Y

According to table 6, to determine the value, it was executed through these formulations, as follow: □

$$DC = R^2 \times 100\%$$
$$= 12, 9 \times 100\%$$
$$= 12, 9\%$$

Thus, it was estimated that DC was 12, 9 %. It signified the estimated three-step interview influence was 12, 9 % to the students, Yet, the rest influences were given by another variable in the CTL model.

(3) To investigate whether the three-step interview influences the students' capability for generating conjecture analytics, the hypothesis examination was conducted. It conducted through the examination value of t_{test} and t_{table}. The significance influences indicated that if $t_{test} \geq t_{tabel}$, then if $t_{test} < t_{tabel}$, the variable does not significantly influence. The result signified that the $t_{test} = 2,004$, and $t_{table} = 1,998$, then, the t_{test} t-test = 2,004, and t-table = 1,668. Moreover, t_{test} (2,004) > t_{table} (1,668). $2,004$ t_{table} $1,998$.

It can be concluded that the variable was significantly influencing. Thus, the three-step interview influences the students' capability for generating conjecture analytics on the SMP layer.

The implementation of a three-step interview generates group discussions as two-way communication between the students. Due to the teaching-learning process, the students are able to communicate their hypothetical ideas. The ideas come from their learning experiences. The students are able to estimate, find solutions, and apply to solve the given problems. These activities signified working conjecture implication within the process. In addition, the teaching process runs smoothly on treatment circulations. Yet, there were students who still less active. It occurred because of the three-step interview, not familiarity applied in the actual classroom. Barkley, Cross, and Major states that the cooperative learning Three-Step Interview model' students are given the opportunity to improve their skills in communication, wherein one indicator of mathematical communication skills is the ability to make a conjecture. Then, the benefits of the implementation of Three-Step Interview by Kagan that share personal information such as hypothesis (alleged), reacted to the sentence, summing up of the information, participation, and listening. It can be concluded that there are significant cooperative learning model three-step interview on the ability of junior high school students make conjectures.

5 CONCLUSION

Based on the results, it can be summed up as follows:

1) From the results of the regression test, the variable X with variable Y has a constant (a) of 21.558 and the regression coefficient (b) of 0.366. □

Thus the regression equation is:

$$\hat{Y} = 21,558 + 0,366X \quad \hat{Y} = 21,558 + 0.366X$$

2) The determinant coefficient was 12.9%, which means the cooperative learning model Three-Step Interview influences 12.9%, while the rest influenced by other variables other than cooperative learning model three-step interview □

3) The $t_{test} = 2,004$ and $t_{table} = 1,668$, with α = 0, 05, it projected t_{test} (2,004) > t_{tabel} (1,998). The hypothesis is accepted because $t_{test} > t_{table}$. The three-step interview influences the students' capability for generating conjecture analytics on the SMP layer. □

Based on the above research conclusion, then there are some suggestions as follows:

1) The type of *Three-Step Interview* model is one method of learning rarely used by teachers of mathematics. Then in practice takes a lot of time. So it is expected for teachers can organize and prepare ahead of time, so that what is expected to be achieved well.

2) It is expected for researchers who want to investigate the cooperative learning model *Three-Step Interview* in order to conduct research on other levels of education, and on different subjects. Then, the measured aspects other than the

ability to make a conjecture.

3) Within the model, the students are encouraged to deliver the *interview* despite joining the group. Thus it is suggested that the teacher gives motivation to evoke the spirit and courage of students in discussions and *interviews,* for example, gives them high marks.

References

[1] Arikunto. Suharsini, "*Dasar-Dasar Evaluasi Pendidikan"*, Jakarta: Bumi Aksara, 1999.

[2] Byers. William, "*How Mathematicians Think: Using Ambiguity, Contradiction, and Paradox to Create Mathematics"*, New Jersey: Princeton University Press, 2007, Page 54.

[3] Daryanto. H, "*Evaluasi Pendidikan"*, Jakarta: PT Rineka Cipta, 2012.

[4] Farzaneh. Nima and Dariush Nejadansari, "*Students' Attitude towards Using Cooperative Learning for Teaching Reading Comprehension"*, *Theory and Practice in Language Studies Journal*, 2014, Vol. 4, No. 2, ISSN 1799-2591, page. 288.

[5] Hadi. Amirul and H. Haryono, "*Metodologi Penelitian Pendidikan 2"*, Bandung: Penerbit Pustaka Setia, 1998.

[6] Hadi. Sutrisno, *Statistik Jilid 2*, Yogyakarta: Penerbit Andi, 1975.

[7] J. P. Ponte, Ferreira. C., Brunheira. L., Oliveira. H., & Varandas. J. M, *"Investigating mathematical investigations"*. In P. Abrantes, J. Porfirio, & M. Baía (Eds.), *Les interactions dans la classe de mathématiques: Proceedings of the CIEAEM 49*. Setúbal: ESE de Setúbal, 1998, page. 4.

[8] Kadir. A, "*Statistika: Untuk Penelitian Ilmu-Ilmu Sosial"*, Jakarta: Rosemata Sampurna, 2010.

[9] Kagan. S. "*The Structural Approach to Cooperative Learning*", Educational Leadership, 1989, 12-15.

[10] Marali. Moh.Alvan. "*Memgembangkan Kemampuan Komunikasi Matematik Pada Siswa Kelas VIII Di SMP N 1 Kabila Bone Melalui Kegiatan Pembelajaran Eksplorasi"*, *Jurnal Pendidikan Matematika FMIPA Universitas Negeri Gorontalo*, 2013, page 2.

[11] Margono, *"Metodologi Penelitian Pendidikan"*, Jakarta: PT Rineka Cipta, 2014.

[12] NCTM, "*Curriculum and Evaluation Standard for School Mathemaics"*.http://btc.montana.edu/ceres/ HTML/picture 5-12/pic5-12math.html, Accessed on October 18, 2016.

[13] Norton. Anderson, "*Student Conjectures in Geometry*", University of Georgia, 2012, page 1.

[14] Nugraheni. Aninditya Sri, "*Penerapan Strategi Cooperative Learning dalam Pembelajaran Bahasa Indonesia"*, Yogyakarta: Pedagogia, 2012.

[15] Permatasari. Indah, "*Proses Kognisi Siswa Kelas X dalam Mengkonstruksi Konjektur pada Masalah Geeralisasi Pola"*, Skripsi Universitas Islam Negeri Sunan Ampel Surabaya Fakultas Tarbiyah Dan Keguruan, Jurusan PMIPA, Prodi Pendidikan Matematika. 2016. page 11.

[16] Prabowo. Agung. "*Memahatkan Spirit Young Mathematicians Pada Diri Siswa*", Seminar Nasional Matematika dan Pendidikan Matematika dengan tema "Peningkatan Kontribusi Penelitian dan Pembelajaran Matematika dalam Upaya Pembentukan Karakter Bangsa" pada tanggal 27 November 2010 di Jurusan Pendidikan Matematika FMIPA UNY, page 453.

[17] Ridho. Nur, "*Model Pembelajaran Kooperatif"*, 2011, page 1.

[18] Riduawan, "*Belajar Mudah Penelitian Untuk Guru-Karyawan dan Peneliti Pemula"*, Bandung: Alfabeta, 2000.

[19] Robertson. Laurel, Neil Davidson, and Roberta L. Dees, "*Cooperative Learning to Support Thinking, Reasoning, and Communicating in Mathematics*", Journal, 2006, page. 9.

[20] Sani. Ridwan Abdullah, "*Inovasi Pembelajaran*", Jakarta: PT Bumi Aksara, 2014.

[21] Sanjaya. Wina, "*Strategi Pembelajaran Berorientasi Standar Proses Pendidikan"*, Jakarta: Kencana, 2009.

[22] Siregar, Nurhasanah and Arna Ritonga, "*Pentingnya Kemampuan Komunikasi dan Penalaran Matematika pada Peserta Didik*", 2011.

[23] Sonarita. Gesca, Haninda Bharata, Rini Asnawati. "*Peningkatan Kemampuan Komunikasi Matematis Melalui Model Pembelajaran Kooperatif Tipe Three-Step Interview*", 2013, page 3.

[24] Sudjana, "*Teknik Analisis Regresi dan Korelasi"*, Bandung: Tarsito. 2003.

[25] Sukardi, "*Metodologi Penelitian Pendidikan"*, *Kompetensi dan Praktiknya*, Jakarta: PT Bumi Aksara, 2003.

[26] Trianto, "*Model-Model Pembelajaran Inovatif Berorientasi Konstruktivistik*", Jakarta: Prestasi Pustaka, 2007.