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The Analysis of Student Learning Outcome Using a Probing Prompting Learning Model

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Abstract--- *This research is an experimental research with 2 factors factorial design, conducted at Eben Haezar High School in Manado. The research subjects were Class XI MIA students consisting of two classes, where 33 students in class XI B received prompting probing treatment and 34 students in Class XI C received direct learning treatment. The purpose of this study was to describe the effectiveness of the prompting probing learning model and analyze the interactions between the prompting and direct learning probing models with numerical abilities on the mathematics learning outcomes. From all students who took part in learning activities with this model, the results were observed when presenting the results of their respective groups, of the 31 who attended the study there were 27 students or 83.87% able to answer questions well, 23 students or 74.19% could give reasons for the answers given and there are 20 students or 64.5% who have dared to give a response. Likewise, for learning completeness, classical learning completeness has met the minimum completeness requirements of 80%. There is an interaction between the mathematics learning outcomes of conical slices of class XI MIA who are given probing treatment and direct learning in terms of numerical abilities.*

Keywords--- *Prompting Probing, Numerical Ability, Learning Outcomes.*

I. INTRODUCTION

In educational process, the actual core of the entire process was the process of teaching and learning between teacher and students. To creating an effective process of teaching and learning, teacher should be able to view his students' character, capable to creating a comfortable and fun learning atmosphere to meet better change. According to Winkel (1991) Learning process was a psychological or mental activity taking place in an active interaction in certain environment which brought about knowledge changes, comprehension, skill and attitude value.

In teaching and learning process, there were four important and influential components to students learning achievement, namely: learning substance, learning environment, media and resources as well as teacher as learning subject (Dimyati, 2013). It referred to how important the concept of comprehension in Mathematics at school is if poured into the Regulation of the Minister of National Education Number 22 in 2006 that consisted of the learning outcomes of Mathematics that students would be able to be: (1) comprehending mathematical concept, (2) using reasoning on pattern and attitude, (3) solving problem, (4) communicating idea, (5) having respectful attitude towards mathematical usage in life.

To implement those outcomes, teacher's awareness to go to extra miles was needed. Yet, there were still a lot of obstacles experienced by teachers at school either from students' side or from teacher himself. The obstacles, as

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experienced by teacher was not having varied models/method applied during learning process. Teacher tended to undertake learning activity by using conventional learning which required students to do more of note-taking and listening to teacher's talk, without experiencing any balance, in this case, an interesting learning model. This sort of obstacle caused students to be less motivated, less-active regarding to participating in teaching and learning process, not focusing and feeling bored to learn which led to the decreasing of interest as well motivation to learn and finally boiled down to the low of learning outcomes.

The result of survey that had taken place at Eben Haezar Highschool in Manado showed that, in general, Mathematics at Science Class grade IX was not yet as expected especially conical slices. It could be seen from the result of examination in year 2016/2017 that the average gained score of the last 3 years were: grade III Mia 1 gained averaged-score 65, grade III Mia 2 gained averaged-score 58 and grade III Mia 3 did 60. To students, the material was one of the most difficult to comprehend. There were causal factors that lower students' outcomes from maximal expectancy. The result of interview taken from the relating teacher conveyed that innovative methods had not been used in learning activity, stuck to speech methods as well as question and answer, one of the causal factors was difficult to arrange their time for they ought to get others subjects done while there were still many students who could not digest the substance. Teacher was not able yet to create a challenging learning environment that most of students were bored, less-motivated and not excited to follow the learning process.

There were varied cooperative learning model/innovative methods that could be applied by teacher to raise the exciting classroom situation to learn. According to Isjoni (2007) cooperative learning was aimed to increase students' performance in dealing with academic tasks. Some experts argued that this learning model was excellent in assisting student to comprehend complicated concepts. Probing prompting learning model was one of cooperative learning models. According to its root word, probing means investigation and examination while prompting means to support or to guide. Probing prompting learning model related to what was known as probing question and promoting question. According to Suyatno (2009), probing prompting learning was a learning model in which teacher presented a series of question that had tendency to lead and to dig so that it could be assembled into a thinking process which relates students' knowledge and experience with new knowledge that is being picked up, then students construct principle concept – rule become new knowledge. Thereby, new knowledge would not be conveyed. The advantage of this model: to pulling students up to think actively, developing students' courage and skill to answer and to put their ideas forward.

According to a research conducted by Suhendar (2012) and Okaviana, Mega and friends (2016) on the implementation of probing prompting in learning, concluded that probing-prompting was able to increase students' comprehension on Mathematical concept. Likewise, research finding by Rachnarani (2017) showed that probing-prompting could increase grade VII senior high students' learning outcomes on algebra and activity. Hence, probing-prompting learning model could be made into alternative to increase students' learning outcomes and comprehension of mathematical concept.

Beside things said above, students' learning outcomes on Mathematics which was low was guessed caused by students' limitation. For instance, students did not really master basic Mathematical calculation as multiplication,

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addition, and division that could possibly become obstruction toward learning process. On the other word, students' low numerical ability that lowered students' learning outcomes. According to Irawan (2014), numerical ability was an ability in utilizing numbers and reasoning which covered Mathematical field, in classifying and categorizing information, thinking with abstract concept to find out relationship between one thing another thing. While Fudyartanta (2004), explained that numerical ability was an ability to calculate, to reason numbers out, to use or to manipulate numerical relation and to explain in logic way. The term numerical reasoning test was often alternately used with numerical ability test.

Numerical ability issue had possibility to occurred in all level of education from Elementary School, Junior High School and Senior High School. Therefore, numerical ability as students' internal factor which could influence learning outcomes specifically Mathematics needed to be considered, for the lower outcomes than expectancy that was estimated as the cause of insufficient numerical ability of students. According to Sudiasa (2012), there was casual effect relationship between numerical ability and learning outcomes. Excellent numerical ability caused excellent outcomes, while insufficient numerical ability caused low outcome score. But the students whose numerical ability was lower than expected could reach higher outcomes score, on the other way, students whose numerical ability was excellent could gain lower outcomes score. Hence, the use of appropriate learning model which was in line with the substance and students' character, was important to be noticed.

The purpose of this study was to describe the effectiveness probing prompting leaning model and to analyze interaction between learning model (prowling prompting and direct learning) with numerical ability (Low and High) toward learning outcomes of Mathematics, in particular, conical slices of students in Eben Haezar High School in Manado.

II. RESEARCH METHODOLOGY

This research as an experiment and the used research design was 2 factor factorial design. A factor was learning model while B factor was numerical ability.

Data tabulation was as described below:

Numerical Ability	Examination (Number of Student)	Learning Model	
		Probing Promoting	Direct Learning
High	1	Y_{111}	Y_{121}
	2	Y_{112}	Y_{122}
	3	Y_{113}	Y_{123}
	4	Y_{114}	Y_{124}
	5	Y_{115}	Y_{125}
	6	Y_{116}	Y_{126}
	7	Y_{117}	Y_{127}
	8	Y_{118}	Y_{128}
	Total	$Y_{11.}$	$Y_{2.}$
Low	1	Y_{211}	Y_{221}
	2	Y_{212}	Y_{222}
	3	Y_{213}	Y_{223}
	4	Y_{214}	Y_{224}
	5	Y_{215}	Y_{225}
	6	Y_{216}	Y_{226}
	7	Y_{217}	Y_{227}
	8	Y_{218}	Y_{228}
	Total	$Y_{21.}$	$Y_{22.}$

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This research was conducted at Eben Haezar Highschool in Manado in year 2018/2019. The research subjects were Class XI MIA students consisting of two classes, where 33 students in class XI B received prompting probing treatment and 34 students in Class XI C received direct learning treatment, with assumption that both classes had relatively similar abilities. Class determination was simply and randomly undertaken.

Treatment variable that was tried out was probing prompting learning model and direc learning model. While respond variable was students' outcomes after treatment was applied. Data were collected by test and non-test. Test instruments were in form of essay questions to obtain learning outcomes. Test material was the definition of conical slices, circle, parabola, and ellipses while high numerical ability and low numerical ability employed score test of numerical ability. Numerical ability test was in form of multiple-choice that consisted of 20 questions which had already been tested in terms of validity and reliability.

According to numerical ability test given to student of XI MIA B and MIA C, after the average and standard of deviation were collected, it turned the previous score into score with 5 standard with formula: $\bar{X}$+1,5 SD, $\bar{X}$+0,5 SD, $\bar{X}$-0,5 SD, $\bar{X}$-1,5 SD (Sudijono, 2009).

From 33 probing prompting students and 34 direct learning model in classroom, the number of both high and low numerical ability score students could be viewed in following table:

Table 2: The number of students whose Numerical ability score high and low in each treatment.

Numerical Ability	**Treatment**	
	Probing Prompting	**Direct Learning**
High	11	8
Low	9	12

There were 11 students with high numerical ability and 9 students with low numerical ability found in the class in which probing prompting treatment was undertaken while direct learning class showed 8 students whose numerical ability was high and other 14 students who had low numerical ability.

Non-test instrument such as questionnaire to discern students' activity and response toward the used model. Analysis data technique was the analysis of two variants factor (two factors ANOVA). A factor was learning model (probing prompting and direct learning while factor understanding numerical ability which categorized low and high. Linear model to factorial experimentation consisted of 2 factors (factor A and factor B) by using the complete basic were:

$$Y_{ijk} = \mu + \alpha_i + \beta_j + (\alpha\beta)_{ij} + \varepsilon_{jk}$$

Where:

Yjik	:	Observation over level I in factor A, level II in factor b and so on
$(\mu,\alpha i,\beta j)$	:	Additive component from average, the effect of factor A and factor B
$(\alpha\beta)ij$	:	Interaction component
εjk	:	The random effect which normally spread

(Montgomery, 2001)

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Treatment was arranged in such a way so that each individual could become subject in both different factors at the same time, which consisted of two levels. Before ANOVA was taken place, homogeneity of variances and data normality would be examined. Data analysis employed SPSS (*Statistical Product and Service Solution)* version 22.

III. RESULT AND DISCUSSION

Description

Descriptive analysis table was presented below:

Table 3: Result of Descriptive Statistics Data

Model	Numerical	Mean	Std. Deviation	N
Probing Prompting	**Low**	57.5000	14.880	8
	High	74.3750	13.742	8
	Total	65.9375	16.352	16
Direct Learning	**Low**	71.0000	16.257	8
	High	61.2500	17.267	8
	Total	65.6250	16.820	16
Total	**Low**	63.7500	16.381	16
	High	67.8125	16.530	16
	Total	65.7813	16.319	32

According to the table above, it could be explained that 8 students whose numerical ability were high and who were being taught by probing prompting gained the average learning result as 74.375 with deviation standard 13.742 while those whose numerical ability were low gained the average score as 57.500 with deviation standard 14.880. Students whose numerical ability were low and being taught by direct learning model gained average score as 71.000 while those whose score were high gained average score as 61.250 with deviation standard 17.270.

In general, class which was taught by using probing prompting, responded well to teacher's way in applying this model. It was seen that enthusiastic students followed the class flow. They were so active and excited to learn. In this technique, teacher presented series of question which more likely to guide and high that ended up to the activation of students' thinking process. According to Suherman (2008), this model might guide students towards the expected theory or concept by using the knowledge that had already been possessed to become new knowledge. Probing prompting technique could also support students to think actively, give chance to students to clarify some things so that teacher could go over what was asked by students, different opinions between students could be compromised or directed to a discussion, as well as developing students' courage and skill in answering and putting forward ideas (Trianto, 2007).

Students with high numerical ability was actively involved to find out and comprehend mathematical concept on conical slices which was studied so that I brought out meaningful lesson. The implementation of probing prompting model gave chance to students with high numerical ability to develop the potential that they had inside them. From all students who followed the learning activity with this model, observation result showed that 27 out of 31 students or 83,87% of them were able to answer the questions well, 23 students or 74,19% of them were able to present reasoning based on the answer that they gave, and 20 students or 64,5% of them had already had the courage to respond. Same thing went to learning completion, based on the result of the last test, classical learning completion

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had already fulfilled the minimum completion requirement which as 80%. Seen from average learning result over conical slices by both classes which were treated by using probing prompting and direct learning model, it showed that the class in which probing prompting model was applied was better than the one in which direct learning model was taught.

Hypothetical Testing

The result of the testing showed that residual data normally spread with significant score as 0,200 which was greater than actual level as 0.05. Normality test used Kolmogorov-Smirnoc test. Levene's test of equality of error variances was used for Homogeneity test. Statistical value F = 0.479 and significant value 0.903. because significant value = 0.700 greater than 0.05 so homogeneity error variance could be concluded.

There were three hypotheses that would be tested:

1. The main effect of Learning Model Factor

H0: $\alpha 1 = \alpha 2$ (There was no tangible difference between the average of students' learning outcomes which was taught by using probing prompting learning model and direct learning model)

H1: $\alpha 1 \neq \alpha 2$ (There was tangible difference between the average of students' learning outcomes which was taught by using probing prompting learning model and direct learning model)

2. The main effect of Numerical Ability Factor

H0: $\beta 1 = \beta 2$ (There was no tangible effect between the average result of students' learning outcomes related to high numerical ability and low numerical ability)

H1: $\mu 1 \neq \mu 2$ (There was tangible effect between the average result of students' learning outcomes related to high numerical ability and low numerical ability)

3. The effect of Interaction

H0: $(\alpha\beta)11 = (\alpha\beta)12$ (There was no interaction between students' learning outcomes; whom learning model was taught to and their numerical ability)

H1: $(\alpha\beta)11 \neq (\alpha\beta)12$ (There was interaction between students' learning outcomes; whom learning model was taught to and their numerical ability)

The result of testing was presented in ANOVA table as follow:

Table 4: Variance Analysis of the Effect of Learning Model and Numerical Ability

Source	**Quadrate Total**	**db**	**Quadrate Average**	**F**	**Sig.**
Treatment	1446.094[a]	3	482.031	1.982	0.140
Learning Model	0.781	1	0.781	0.003	0.955
Numerical Ability	132.031	1	132.031	.543	0.467
Learning Model * Numerical Ability	1313.281	1	1313.281	5.400	0.028
Error	6809.375	28	243.192		
Total	146725.000	32			

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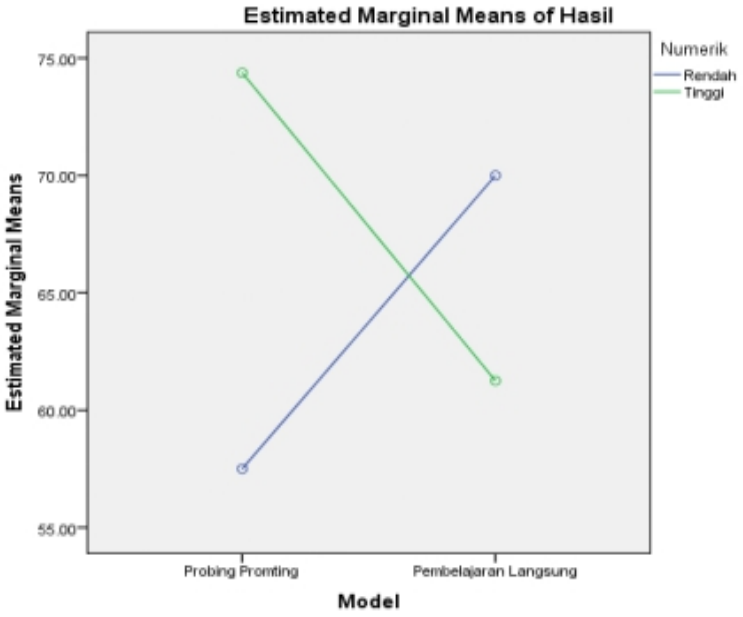
From the table presented above, on Learning_Model *Numerical_Ability row, it could be seen that because the significant value was 0.027 graters than the chosen tangible level which was 0.05, so it was concluded that there was interaction between learning models (probing prompting learning model and direct learning model) and numerical ability (high, low). Interaction plot was casted into picture below:



Picture 1: Interaction Plot between Learning Model and Numerical Ability

From the interaction plot above, it could be pictured that, mathematically, students with high numerical ability whose learning outcomes were treated by probing prompting model shoed better result than those who were treated by direct learning model. This could be seen from the average score of mathematics outcomes particularly conical slices. Group of students who were treated by probing prompting reached (74.375) greater than the result made by those whom direct learning model was treated by (61.250). Meanwhile, students with low numerical ability was better to be taught by direct learning model.

To obtaining more comprehensive conclusion, it is necessary to conduct further test to observe simple effect from each factor which was the logical consequences of factorial model. Result of further test by employing t test was as follow:

Table 5: Result of Further Test by using t-scheffe Test

Model	**Numerical Ability**	**Mean Difference**	**Sig.**
Probing Prompting	High, Low	16.875*	0.034
Direct Learning	High, Low	9.750*	0.045

*. The mean difference is significant at the 0.05 level

The result of t-test showed that there was significant difference between students with high numerical ability and students with low numerical ability on conical slices taught by using probing prompting. Students with high

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numerical ability were better than those whose numerical ability were low. There was also significant students' learning outcome between students with high numerical ability and those with low one on conical slices taught by using direct learning model. Students with low numerical ability were more superior if taught by using direct learning model.

This phenomenon showed that variable of numeric ability as one of students' characteristics in learning Mathematics contributed to determine the effect of the implementation of learning approach towards mathematics learning outcomes. Numerical ability was the core ability that needed to be possessed in mastering mathematical field. With numerical ability owned by students, it would assist them in comprehending material and would also assist them in analyzing issues as well as applying mathematical concept in daily activity. To reach maximum learning result, students who already had certain numerical ability needed certain learning methods as well. Numerical ability was the ability that related to accuracy and exactness in the using of basic calculation function. If it was combined with the ability to recollect, this ability could be able to convey someone's intellectual ability most importantly arithmetical reasoning and logical thinking.

This finding was in line with research conducted by Komang Ayu (2013) which concluded that there was significant interaction between learning approach and numerical ability towards mathematics learning achievement. The same thing applied to Sudiasa's (2012) research on inquiry learning model and numerical ability in mathematics which concluded that there was interaction between learning model and numerical ability towards students' learning outcomes. Students with high numerical ability obtained higher result on inquiry learning rather than conventional learning model.

IV. Conclusion And Suggestion

Research finding showed that there was interaction between mathematics learning outcomes especially conical slices of XI MIA students of SMA Eben Haezar who were treated by using probing prompting and direct learning observed from numerical ability. Learning outcomes of students with high numerical ability was better than those with low numerical ability if taught by using probing prompting. Meanwhile, learning outcomes of students who were taught by using direct learning and with low numeric ability was better than those with high numeric ability. This finding conveyed that students with certain numerical ability needed certain learning method as well in order to obtain the expected learning outcomes.

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