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Differences Representation Ability and Mathematical Disposition Students Who Realistic Mathematics Learning and Contextual Teaching and Learning Approached (CTL) in SMP N 12 MEDAN

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Abstract
The purpose of this research is to analyze: (1) difference of mathematical representation ability between students who are given realistic mathematics learning approach and given CTL, (2) difference of mathematical disposition between students who are given realistic mathematics learning approach and given CTL, (3) the interaction between mathematics learning (realistic mathematics learning approach and CTL) with students 'early mathematical abilities on students' mathematical representation abilities, (4) interaction between mathematics learning (realistic mathematics learning approach and CTL) with students 'early mathematical abilities on students' mathematical dispositions. The kind of this research is quasi experiment. The population of this research is all students of SMP Negeri 12 Medan. The sample of research was taken randomly as many as 2 classes amounted to 64 students. The analisys is used by using 2 rutes anava. The results of this research shows that: (1) there are differences in the ability of mathematical representation between students who are given realistic mathematics learning approach and those given CTL, (2) There is difference of mathematical disposition between students who are given realistic mathematics learning approach and given CTL, (3) there is no interaction between mathematics learning (realistic mathematics learning approach and CTL) with students' early mathematical ability to students' mathematical representation, (4) there is no interaction between mathematics learning (realistic mathematics learning approach and CTL) with students' mathematical early ability to student mathematical disposition.
Keywords: Realistic mathematics learning approach, CTL Learning, Representation Ability, and Mathematical Disposition.

1. Introduction

The National Council of Teachers of Mathematics (NCTM) (2000: 185) sets out 5 standards of mathematical ability that students must possess: problem solving, reasoning, communication, connection and representation. The ability of a mathematical representation to be one of the standard capabilities of the process contains several reasons. This is supported by the opinion of Jones (2000: 35):

> There are three reasons why representational representation is one of the standard processes: (a) The smoothness of translation between different types of representation is a basic skill that students need to develop a concept and think mathematically; (b) Mathematical ideas presented by teachers through various representations will have a great influence in learning mathematics, and (c) Students need training in building their own representations so that students have the ability and understanding of good and flexible concepts that can be used in solving problem

Representations are expressions of mathematical ideas that students use in an attempt to find solutions to mathematical problems as a result of their interpretation of the mind. A problem can be represented through images, words (verbally), tables, concrete objects or mathematical symbols. Furthermore, according to NCTM (2000: 280) "Representation is central to the study of mathematics. Students can develop and deepen their understanding of mathematical concepts and relationships as they create, compare, and use various representations. Representations such as physical objects, drawing, charts, graphs, and symbols also help students communicate their thinking ". Students have the ability to represent mathematically if they can:

1. Present data or information from a representation to a representation diagram, graph or table
2. Creating equations or mathematical models of a mathematical problem (adapted from NCTM, 2000: 1995 and Cai Lane Jacabsin, 1996: 243)

But in fact, based on the results of initial observation in SMP Negeri 12 Medan mathematical representation of students still received less attention from math teachers at school. Students still tend to be given routine problems where the solution can be obtained by imitating from the book so that students do not make their own representation of the problem. So when students are given different problems students are not able to solve the problem. As Hudiono (2010: 102) says, "The limited knowledge of teachers and the habits of students learning in the classroom in conventional ways has not been possible to cultivate or develop optimal student representation." This is supported by the results of the International Trends International Mathematics and

Science Study (TIMSS) 2011 conducted by the International for the Evaluation of Educational Achievement (IEA), specifically for problems related to students' mathematical representation, the average percentage of Indonesian students who answered actually only reach 25% this result is below the international average that is 41% (IEA, 2013: 1-121).

In addition to the abilities associated with the ability of mathematical representation, also need to develop an attitude of appreciating the usefulness of mathematics in life that is; have a curiosity, interest and interest in learning mathematics, as well as a tenacious attitude and confidence in solving problems. The development of the affective domain that the educational goals of the 2013 curriculum will essentially cultivate and develop a mathematical disposition.

The mathematical disposition is the students' self-confidence in their abilities, the strong desire of the students to learn mathematics and perform various mathematical activities, curiosity in learning mathematics, flexible thinking to explore various problem solving alternatives, diligent and earnest. The definition is reinforced by NCTM (1989: 233) which states "Mathematical disposition is the correlation and appreciation of mathematics is a tendency to think and act in a positive way". Students have a mathematical disposition if the student has: (1) Confidence in mathematics learning and in solving mathematical problems; (2) Flexible in mathematical learning which includes searching for mathematical ideas and attempting various alternative solutions to mathematical problems; (3) Be persistent and tenacious in doing mathematical tasks; (4) Having curiosity in learning mathematics; (5) Reflecting on the way of thinking and self-performance in learning mathematics; (6) Appreciate the application of mathematics in other fields and everyday life; and (7) To appreciate or appreciate the role of mathematics lessons in other fields and everyday life. (NCTM, 1989: 233; Maxwell, 2001: 31; Shaban, 2008: 33 and Kilpatrick, 2001:131)

Furthermore, Feldhaus (2014: 95) states "A student's mathematical disposition is a key component to his or her success learning mathematics". From the expert opinion above, it is clear that mathematical disposition is very important and must be owned by students to support the achievement of learning objectives. But in fact the mathematical disposition of students is still low. This can be seen from Kesumawati research (2010: 364) to 297 students from 4 junior high schools in Palembang. The results showed that the percentage of the average score of disposition score of 58% was in the low category. Further research from Multina, M (2015: 235) MTs Ulumuddin in Medan. The results showed that achievement of each indicator of mathematical disposition did not reach the achievement limit of 65%

The ability of students is low because schooling is too focused on knowledge transfer rather than knowledge building alone. Soedjana (1986: 1) states:

> In traditional teaching methods, a teacher's person is regarded as the source of knowledge, the teacher dominates the class. Master directly taught mathematics, proving all the arguments and giving examples. Instead students should sit neatly, listen calmly and try to imitate the ways teachers prove the theorem and how to do the questions. Thus the atmosphere of learning and learning are orderly and quiet. Pupils are passive and teachers are active. Students who can do exactly the same questions as their teacher will get the most value. Students are generally given less opportunity to take the initiative, seek their own answers, formulated the arguments. Students are generally expected to ask questions about how to solve problems rather than why they are solved.

Impact, learning can't provide meaningful learning experiences, but simply the delivery of facts without meaning. The teacher still actively explains the subject matter, gives examples and exercises while the students act like machines, the students hear, record and do the exercises given by the teacher.

From these descriptions, it is necessary to have a lesson that conditioned the student actively in learning mathematics and related to the student's mathematical representation and disposition. Many learning lessons can be used to develop students' mathematical representations and dispositions, one of which is realistic mathematics learning. The approach of realistic mathematics learning is a learning that leads students to construct mathematical concepts through real problems or phenomena. Through realistic mathematics learning, mathematics learning is more meaningful for students because students know the benefits of learning math in solving problems encountered in everyday life. This can be seen from the syntax of realistic mathematical learning approaches: (1) Understanding contextual problems, (2) Explaining contextual problems, (3) Resolving contextual issues, (4) Comparing or discussing answers, (5) Summing up. (Lestari, 2014: 1). Based on the syntax of the learning approach of realistic mathematics students will be able to bring up its representation. It can be seen from the characteristics that will appear in the learning, among others, understanding the context and construction of students and interactive in learning.

In addition to the realms of realistic mathematics learning, other mathematics learning that as same realistic mathematics learning is learning Contextual Teaching and Learning which is further mentioned by learning CTL. CTL learning is a learning that emphasizes the full process of student involvement in order to find the material learned and relate it to real life situations that encourage students to apply it in real life. Furthermore, according to Howey, R. Keneth (2010: 189) "Contextual teaching is teaching that enables learning in which student employ their academic understanding and abilities in a variety of in-and out of school context to solve simulated or real world problems, both alone and with others". Learning CTL will stimulate the brain to arrange patterns that produce meaning, which consists of the parts that are connected. The syntax of CTL learning is (1) Constructivism (constructivism), (2) Inquiry, (3) Questioning, (4) Learning Community, (5) Modeling, (6) Reflection, and (7) Authentic assessment Trianto (2011: 111). Through constructivism, inquiry and student learning societies will be able to elicit its representation.

The ability of students' mathematical representation and disposition is not only encouraged from the learning learning that is used but also influenced by the student's math in the early years as well. Math in the early years required students to achieve instructional goals. Math in the early years is the ability that has been possessed by students before following the lesson to be given. Math in the early years describes the readiness of students in receiving lessons to be conveyed by teachers. As the Education Commission of the States (ECS) (2013: 1) states: "The student's early mathematical ability not only predicted success in mathematics, but also predicted student achievement". Early mathematical ability is an important factor in mathematics learning. This is in accordance with the results of research conducted by the ECS (2013: 2) which shows that Math in the early years is very important for students because: (1) There is a predictive power of Math in the early years; (2) Math in the early years predicts learning achievement even to high school; (3) Achievement is better than skills; (4) Math in the early years can improve students' mathematical disposition; (5) Math in the early years enhances academic success in all subjects; and (6) All children need strong mathematical knowledge at their early ages.
Math in the early years becomes very important because it will affect a student in receiving new knowledge because the topic of mathematics is sustainable and interconnected. If students have not understood the basic concept before, then students will have difficulty in accepting the next new concept. A good input is expected to produce a good output.

2. Method

This type of research is quasi experiment. The population of this research is all students of SMP Negeri 12 Medan. The sample in this research is all students of class VII-4 and class VII-6 SMP Negeri 12 Medan. The students of grade VII-4 were selected as experimental class 1 and given realistic mathematics learning, while the students of class VII-6 as experimental class 2 were given CTL lessons. The instrument used consist of: (1) test of math in the early years (2) test of representation ability and (3) mathematical disposition questionary. After the test of math in the early years is done, next, data analysis is done as homogenity test by using F test, the normality test by using chi square and for test of representation ability and mathematical disposition of the students using 2 rutes Anava

3. Result and Discussion

3.1 The Description of the Early Mathematics Ability

Before discussing the research data from the results of the test of representation ability and mathematical disposition of the students, the researcher first discusses the results of the first math ability test of the students. This test was given to find out the equivalence of experimental 1 and experimental 2 groups, and to grouping students according to high, medium and low.

Table 1 Sample Research Distribution

Category Class	Statistics	Group	
		Eksperimental 1	**Eksperimental 2**
High	Sum	8	8
	Average	87,50	88,13
	Standart Deviation	2,67	2,59
Medium	Sum	16	17
	Average	75,63	75,29
	Standart Deviation	4,03	3,74
Low	Sum	8	7
	Average	63,57	62,86
	Standart Deviation	0	0

3.1.1 Normality Test of The Early Mathematics Ability

Table 2. The Result of Normality Test of The Early Mathematics Ability

Test Statistics

	Experimental 1	Experimental 2
Chi-Square	3,000[a]	3,875[a]
Df	6	6
Asymp. Sig.	,809	,694

From the taTble 2 above we can see that the value of significance is greater than the level of significance value (sig.) A = 0.05. Where for experiment class 1, 0.809> 0.05, while for experimental class 2 0.694> 0.05. This means that score data of the students from both groups of samples comes from normally distributed populations.

3.1.2 Homogenity Test of The Early Mathematics Ability

Table 3. The Result of Normality Test of The Early Mathematics Ability

Test of Homogeneity of Variances

Levene Statistic	df1	df2	Sig.
,005	1	62	,946

Based on Table 3, giving significance score = 0,215 is bigger than α = 0,05, thus H0 is received. Therefore, both of sample come from the population that has homogen varians.

3.1.3 Equal Rate Data Equivalence Test The early Mathematics

Table 4. The Result t-test

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
KAM	Equal variances assumed	,005	,946	-,068	62	,946	-,156	2,310	-4,774	4,461
	Equal variances not assumed			-,068	61,969	,946	-,156	2,310	-4,774	4,461

From the above output results can be seen that the value of significance is 0.946> 0.05. This means that both experimental classes have a relatively equal average.

3.2 The Description of Students' Mathematical Representation Ability

Representation ability test is essay test with Opportunities material. Every question Deputes 2 indicators of representative ability, namely: (indicator 1) reserve the data or information from a representation to the diagram representation, grafic or table, (indicator 2) finishing the problem by including the mathematic expression. The result of summary presentation from the students' achievement can be seen in this Figure 1.

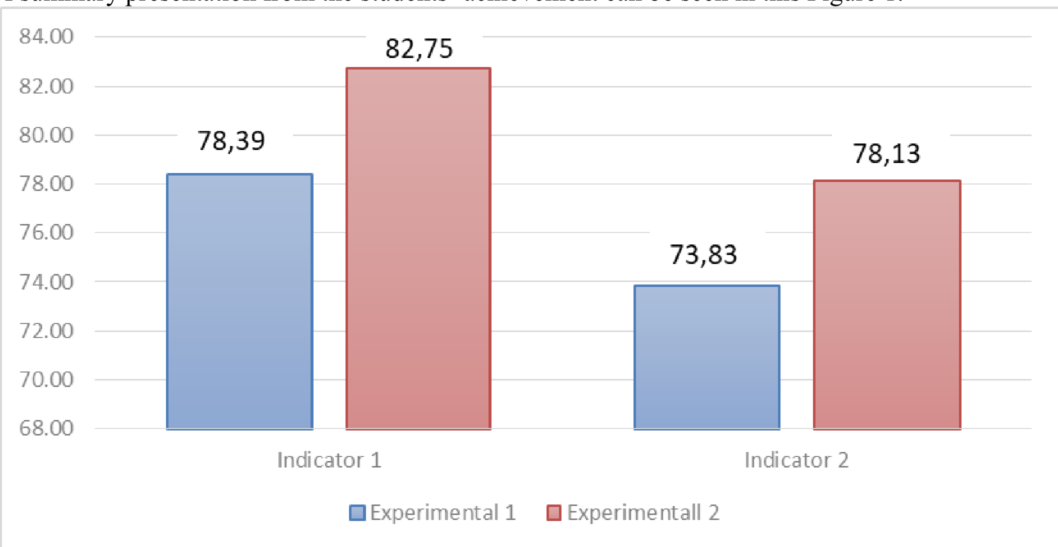


Figure 1. Average Post-test of Mathematical Representation Ability by Indicator

Based on Figure 1, can be concluded that the indicator most mastered by the students to mathematical representation ability is indicator 1 namely represents data or information from a representation to a representation of diagrams, graphs or tables.

The average posttest of students' mathematical representation abilities is based math in the early years can be seen in this Figure 2.

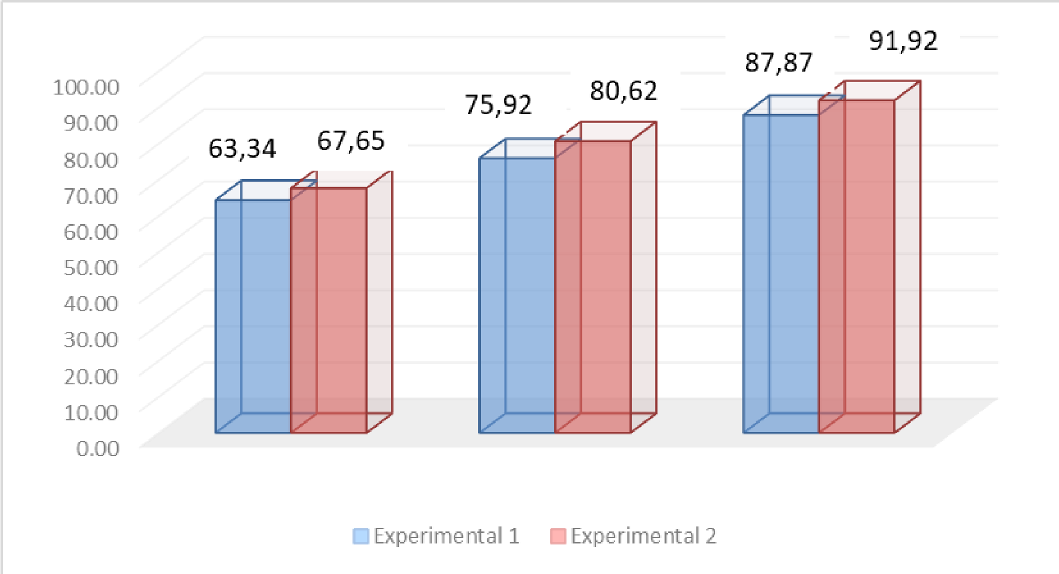


Figure 2 Average Post-test of Mathematical Representation Ability Based on Math in The Early Years

Based on Figure 2, can be concluded that the average of students' representation ability in the high mathematics early ability category in both experiment 1 and experimental group 2 was higher than other categories of early mathematical ability categories.

3.2.1 Hypthesis Test

a. First and third Hypothesis

The test results showed that the sample came from the normal distributed population with the variance of each pair of homogenous data groups, then the two-lane ANOVA statistical analysis was performed. The statistic tested are:

H_0: $\mu_{11} = \mu_{12}$

Ha: $\mu_{11} \neq \mu_{12}$

μ_{11}= Average students' mathematical representation abilities with realistic mathematics learning approach

μ_{12} = Average ability of students' mathematical representation with CTL approach.

H_0: $(\alpha\beta)_{ij} = 0$

H_a: Minimal one $(\alpha\beta)_{ij} \neq 0$

Note:

α : averages math in the early year group

β : averages learning approach

i = 1,2,3 dan j = 1,2

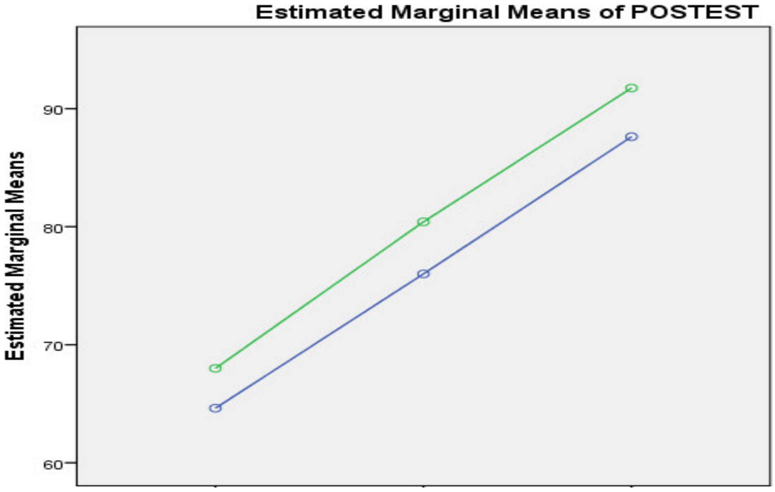
Table. 5 ANAVA Test of Mathematical Representation Ability
Tests of Between-Subjects Effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	Hypothesis	343266,921	1	343266,921	1546,334	,016
	Error	221,988	1	221,988[a]		
KAM	Hypothesis	4221,017	2	2110,508	1526,098	,001
	Error	2,766	2	1,383[b]		
PENDEKATAN	Hypothesis	221,988	1	221,988	124,686	,001
	Error	6,470	3,634	1,780[c]		
KAM * PENDEKATAN	Hypothesis	2,766	2	1,383	,140	,869
	Error	571,368	58	9,851[d]		

Based on the result of ANAVA 2 rutes in Table 5, thus we got:

1. p-value = 0,01 < 0,05 it means there are differences in the ability of mathematical representation between students who are given realistic mathematics learning approach and those given CTL
2. p-value = 0,869 > 0,05 it means) there is no interaction between mathematics learning (realistic mathematics learning approach and CTL) with students' early mathematical ability to students'

mathematical representation



Low Medium High

Note: Realistic mathematics approach
CTL Approach

Figure 3. There is No Interaction Between Mathematical Representation Ability Based on Learning Approach and Early Mathematical Ability

3.3 The Description of Students' Mathematical Representation Ability

Based on the data of the mathematical disposition scale obtained the average data of the scale of the mathematical disposition of the students of experimental class 1 and experimental 2 based on the aspects presented in figure 4 below:

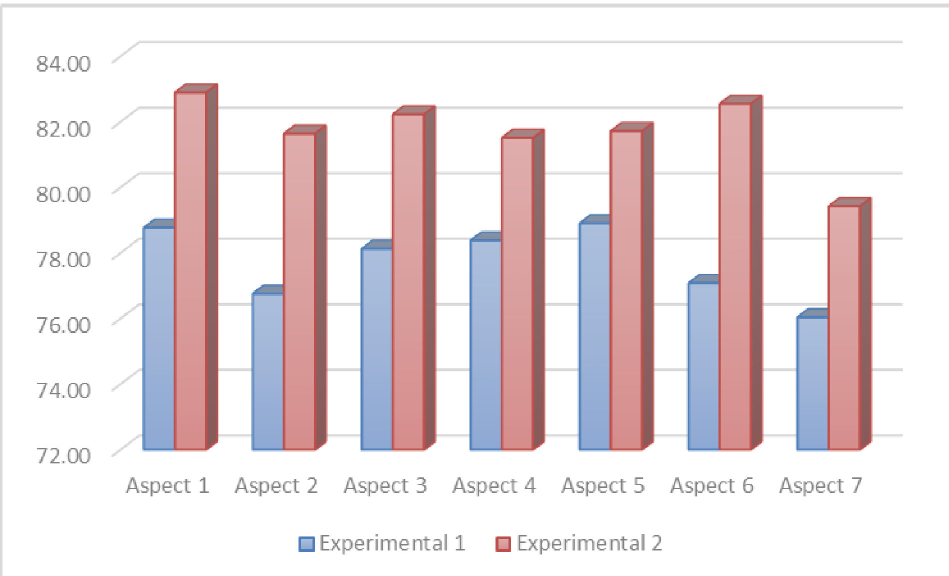


Figure 4 Average Mathematical Scale Student Disposition Data Based on Aspect

Based on Figure 4, can be concluded that the average of students' mathematical disposition in experimental 2 was higher than experimental 1 group for all aspect.

The average mathematical disposition is based math in the early years can be seen in this Figure 5.

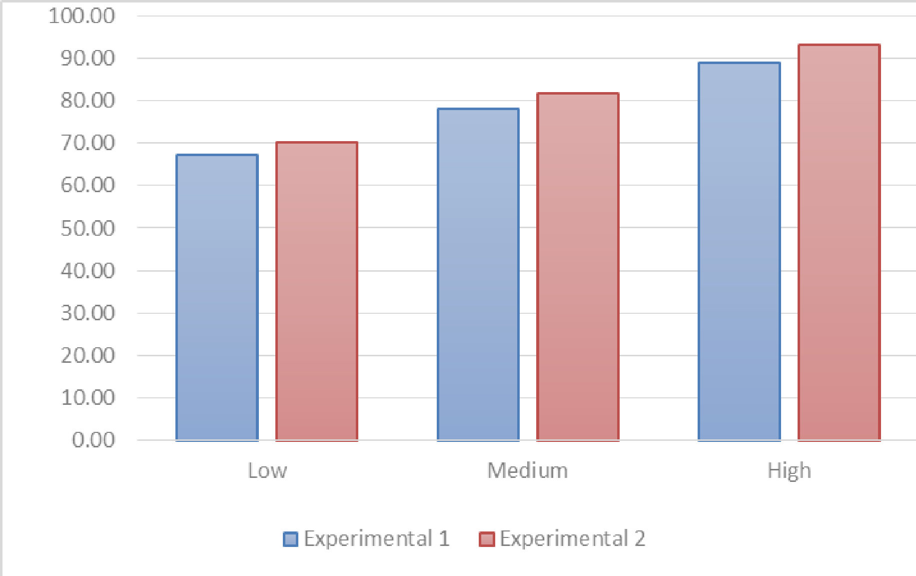


Figure 5 Average Mathematical Student Disposition Scale Data Based o Math in The Early Years

Based on figure 5, can be concluded that the average of students' mathematical disposition in the high mathematics early ability category in both experiment 1 and experimental group 2 was higher than other categories of early mathematical ability categories

3.3.1 Hypthesis Test

a. second and fourth Hypothesis

The test results showed that the sample came from the normal distributed population with the variance of each pair of homogenous data groups, then the two-lane ANOVA statistical analysis was performed.

The statistic tested are:

H_0: $\mu_{21} = \mu_{22}$

Ha: $\mu_{21} \neq \mu_{22}$

μ_{21}= Average mathematical disposition of students with realistic mathematics learning approach

μ_{22} = Average mathematical disposition of students with CTL approach.

H_0: $(\alpha\beta)_{ij} = 0$

H_a: Minimal one $(\alpha\beta)_{ij} \neq 0$

Note:

α : averages math in the early years

β : averages learning approach

i = 1,2,3 dan j = 1,2

Table 6 ANAVA Test of Mathematical Disposition

Tests of Between-Subjects Effects

Dependent Variable: Mathematical Disposition

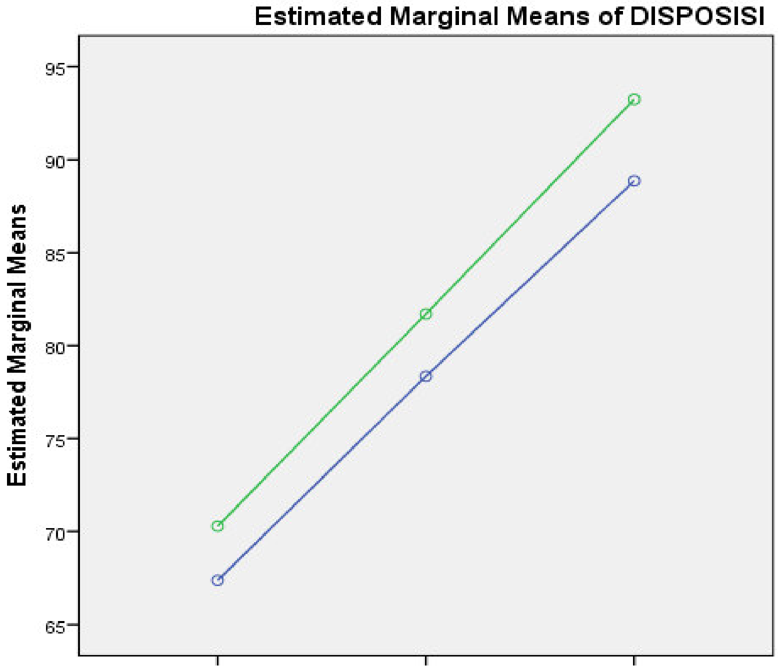
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3984,928[a]	5	796,986	80,662	,000
Intercept	352383,326	1	352383,326	35664,307	,000
KAM	3687,694	2	1843,847	186,614	,000
PENDEKATAN	173,811	1	173,811	17,591	,000
KAM * PENDEKATAN	4,456	2	2,228	,225	,799
Error	573,072	58	9,881		
Total	414158,000	64			
Corrected Total	4558,000	63			

a. R Squared = ,874 (Adjusted R Squared = ,863)

Based on the result of ANAVA 2 rutes in Table 6, thus we got:

1. p-value = 0,00 < 0,05 it means There is difference of mathematical disposition between students who are given realistic mathematics learning approach and given CTL

2. p-value = 0,799 > 0,05 it means there is no interaction between mathematics learning (realistic mathematics learning approach and CTL) with students' mathematical early ability to student mathematical disposition.



Low Medium High

Note: Realistic mathematics approach
CTL Approach

Figure 3. There is No Interaction Between Mathematical Disposition Based on Learning Approach and Early Mathematical Ability

4. Conclusion

Based on the results of data analysis research on the ability of representation and mathematical disposition of students who were taught with realistic mathematics learning approach and CTL, then obtained some conclusions as follows:

1. There are differences in the ability of mathematical representation between students who are given realistic mathematics learning approach and those given CTL,
2. There is difference of mathematical disposition between students who are given realistic mathematics learning approach and given CTL,
3. There is no interaction between mathematics learning (realistic mathematics learning approach and CTL) with students' early mathematical ability to students' mathematical representation,
4. There is no interaction between mathematics learning (realistic mathematics learning approach and CTL) with students' mathematical early ability to student mathematical disposition.

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