The Discrepancy of Students' Mathematic Achievement through Cooperative Learning Model, and the ability in mastering Languages and Science

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Abstract:

This experimental research with factorial 3x3 design aims at: (1) finding out the senior high school students' mathematic achievement through (i) the effect of math on students' language (Indonesian, English) and Science achievement, (ii) the effect of cooperative learning methods, namely Jigsaw, STAD, TSTS with certain condition of language mastery level (Indonesian, English), (iii) the effect of Science and language mastery (Indonesian, English), (iv) the discrepancy type 1, 2, 3, 4 and math achievement on the condition of Science and language mastery (Indonesian, English). The analysis result under hypothesis testing shows that (i) Math subject has significant and positive effect on students' language (Indonesian, English) and Science mastery; each contributes 0.098; 0.089; and 0.808 which indicates that math can enhance the mastery of language (Indonesian, English) and Science, (ii) cooperative learning method including Jigsaw TSTS, STAD has significant effect, (iii) the discrepancy type 1, 2, 3 do not have significant difference, and (iv) discrepancy type 4 has significant effect on students' math achievement.

Keywords: discrepancy, cooperative learning, the mastery of language and science, mathematic's achievement.

INTRODUCTION

The problem faced by almost every regions particularly in Southeast Sulawesi province and generally in Indonesia is the existence of discrepancy in all aspects of life, such as (i) economic gap exists between the poor and rich family, (ii) job discrepancy exixts between those who have and do not have job, (iii) behaviour gap exists between those who have good and bad act, (iv) education gap exists between a group of society who gets and does not get proper education, (v) learning quality gap exists between the clever and unclever students, (vi) teachers' quality difference exists between teachers who have good and bad mastery of learning material, (vii) the discrepancy of students' achievement, and so on. The discrepancy of learning means there is different achievement between certain group of students and the others or it is called as difference in differences.

The discrepancy of students' mathematic achievement had been investigated by the writers either in elementary school or junior high school entitled (i) the difference of mathematic's achievement under the implementation of teaching method and feedback in the public junior high school which indicates that there is significant difference between control and experimental class (Maonde, 2012: 1-4), (ii) the difference of students' math achievement under implementation of cooperative learning model and students' parents employment status in public junior high schools which concludes that there is difference between control and experimental class (Maonde, 2013a: 99-116), (iii) the discrepancy of students' math achievement based on the mastery of Science and language in public junior high schools indicated that there is significant difference between control and experimental class (Maonde, 2013b; 101-126), (iv) the difference of students' math achievement based on the mastery of Science and language in elementary schools which indicated that there was no difference between control and experimental class (Maonde, 2014: 1-26), and (v) the discrepancy of students' math achievement based on the mastery of Science and language in senior high schools of Kendari, Southeast Sulawesi which concludes that there was no difference type 1, 2, 3 existing but type 4 brough different result.

The problems mainly investigated in this research are: (a) is there any discrepancy type 1, 2, 3, and 4 of mathemetic achievement under the implementation of cooperative learning model with the condition of certain mastery level of languages (Indonesian, English), and Science, and (b) is there any discrepancy type 3 and 4 of mathematic achievement based on the mastery of language and Science of students with the cooperative learning model condition. These problems could be overcome by conductiong experimental research with factorial 3x3 design covering cooperative learning experimental model and the students ability in languages and Science. The gap exists due to the misimplementation of education in general and particulary in teaching learning process, especially in regard to the students' assessment.

Teachers as indicator and main role to encourage students for studying math partly somehow have not met the competence requirement expected by all stakeholders in order to increase students' achivement. It has been proven by the result of teachers' competence in Teacher Competence Testing (UKG) in the last two years; 2011 and 2012 which was still under the national average, or placed in 20th of 33 provinces in Indonesia (Anon, 2013: 1 and 7) column 5-7 of Kendari Ekspres newspaper.

Learning is a behaviour change. Behaviour should be seen in wider meaning which consists of observation, introduction, action, skills, interests, attitudes, etc (Nasution, 1995: 59). The changing of behaviour and skill to change something is limited to the meaning inside of learning

process, because of the skills to change something through learning , students can freely explore, choose, and determine the importance decisions in their life, and the behaviour changes happened as a result of learning process is called as students' achievement. Hence, learning is not only about intelectual major, but it covers all aspects of students' life, cognitive, affective, and psychomotor as well. According to Slameto (2003:2), learning is a kind of effort done by someone to get whole behavior change, as a result of her/his experiences during her/his interaction to the environment. Based on this definition, Slameto expresses the characteristics of behavior change because of learning process, as follows: (1) the change exists conciously, (2) the change occurs continuously and in a functional way; (3) it is active and positive; (4) it is not a temporary change; (5) it is specific-purpose and well-directed; (6) it covers all of the behavioristic aspects of life. In line with that, Zainal points out that learning is a changing process in every human being. If after experiencing a learning process, and there is no alteration occured, it means that he/she do not learn (Aqib, 2002:43).

Cooperative learning enabling the students to interact to each other is through cooperative learning model. This model owns some types. The types which can encourage students' confidence and participation are Think-Pair-Share, Two Stay Two Stray (TSTS), STAD, and Jigsaw. A variety of cooperative learning model having significant effect on students' achievement has been proposed by Sahidin and Muliani (2010:23), Lan Dia (2010:53), Tiya and Sufiyana (2011: 53), Ismaimuza (2011:19); Ikman and Erlin (2011:101-102), Lasingga (2011, 65), Maonde (2010:67, 2012a:13, 2012b:114-115, 2013a: 98, 2013b:124-125, 2014:34).

Student oriented learning process in which teacher plays role as mediator, facilitator, and source of study during its process is known as constructive learning process. This learning type refers to an effort to educate students because learning is a wide and specific measurement determined by intellegence. Piaget (in Yamin, 2012:10) explains that intellegence is a continuous and going over process. The mechanism of individual interaction with their environment on certain time and in continuous process forms themselves; their self-esteem. Dewey (in Yamin, 2012; 11) remarked that school is a laboratorium for students to test and investigate something to overcome their problems in the daily life. Dewey also pointed out that during learning process, students should be given a chance to give opinon. Chance during learning process is only available in cooperative learning model.

Slavin (2005:5-12) insisted that a set of problems in implementation of cooperative learning relates to group work to encourage individual to work independently. Maonde (2012:175) in the previous research entitled "The Discrepancy of Students' Math Achievement through Cooperative Learning Model and Students' Parents employment status (experimental study in the public junior high school of Kendari). It indicated that by applying character lesson plan in classroom, there was difference of students' math achievement under cooperative learning models, namely TSTS, TPS as the treatment and conventional method as control class, and parents' job as coovariate (civil servant and non-civil servant), the discrepacy of students' math achievement is measured in accordance of cooperative learning model and Science mastery. The result indicated that there is still discrepancy between the use of cooperative learning model and language and Science ability of students, also found by Akinsola & Olowojaiye (2008: 1-15).

Piaget states that knowledge is not gained passively by someone but action. The development of children knowledge relies on how far they are ectively manipulated and interacted

with their environment. Its development is a continuous process of balance and imbalance condition (Poedjadji, 1999: 611) and Tasker (1992:30) (cited in Yamin: 2012:15) points out three main things in constructivism theory, namely (i) students' active role in constructing their knowledge as meaningful as they can, (ii) the importance to relate many ideas of meaningful knowledge, and (iii) to relate ideas and new information gotten.

Vygotsky (Arends, 2004: 396) (in Yamin, 2012:19) introduced a term called Zone of Proximal Development (ZPD) which is significant socio-cultural dimension as psychology dimension. ZPD refers to the distance between actual and potential development level. Such distance consists of four phases, as follows: (i) more dependence to other stage, which means that children performance relies so much on the assistance of their peer, parents, teacher, society, experts, ets. This phase encourages the exixtence of cooperative learning model in children cognitive development constructively, (ii) internalization external assistance stage, in which the children do not expect to much to others' help, but to self-assistance, they tend to help themselves, (iii) internalization and automatic stage, in which the children performance is internalized automatically. The awareness of self development importance might appear automatically without more force or direction than other sides. However, the children, in this phase, have not reached the real maturity and they still figure out their true identity so as to achieve the mature self-capacity, (iv) deautomatization stage, in which the children are able to express their feelings from soul, heart, and emotion repeatedly, inversely, recursion. In this stage, the deautomatization appears as the real climax performance of children.

The basic characteristics of cooperative learning model are (i) students should perceive that they would be sink and swimming together, (ii) they should be responsible for themselves to learn the material, (iii) they should perceive that they have the same point of view on something, (iv) they should divide their own duty and responsibility among the group members, (v) students are given an evaluation or reward affecting their group assessment, (vi) every student will be reponsible for their own material handled in their cooperative group. Three central concepts of cooperative learning characteristics are (i) group rewards: group success is based on individual performance as group member to create interpersonal relationship supporting, helping, and caring each other. The group rewards are gained if their group score is beyond the fixed assessment, (ii) individual accountability: emphasize on each group member activity supporting each other. The individual accountability makes every member always ready to face examination or any other test independently without teammate's assistance, and (iii) the same chance to achieve success: using scoring method to cover all development value in accordance of achievement improvement of every student though. Using the scoring system enables every student whether they have high, mid, or low score have the same chance to success or do the best for their group.

Experimental research on math education have coloured Mathematic Education Journal for the last five years, from 2010 to 2013. The research mentioned previously are as follows: (i) Kansil and Misrawati (2010:35-44) found that contextual learning model is more effective than conventional way; (ii) Maonde (2010:67) said that interest and basic knowledge on math have siggnifficant effect on students' math achievement; (iii) Hasnawati and Ardin (2010:131-142) concluded that constructive learning model is more effective than conventional one; it is in line with: (iv) Lambertus (2010: 153-166); Kadir (2010:167-178); Permana (2010: 179-191); Ismaimuza

(2011:18); Tiya and Sufiana (2011:31), each of them had applied cooperative learning model from different learning type, such as: Jigsaw, TSTS, STAD, Make a Mach, Team Game Tournament.

Jigsaw method was originally developed by Elliot Aronson et all (1992) from Texas University, and adapted then by Slavin et all. This type is one of cooperative learning model consisted some members in one group who have responsibility for certain material for each member and teaching them to other members in their group (Arends, 1997). Jigsaw is a cooperative learning type in which the students learn in small group of 4-6 members heterogenously, cooperate, depend on each other, and responsible for the completeness of material dan then teach those to other member of group.

Jigsaw is designed to enhance the students' accountability on their own and others learning as well. Students do not only learn given material, but also they have to be ready to share and explain those to other groups. Students, thus, depend on each other and work together as a team to learn the certain material. The members from other teams with the same topic meet and discuss (expert team) that lead to help each other about that topic. After that, those students should get back to their own group and tell what have been discussed with the expert team. In this type of cooperative learning model, there are called as home and expert team. Home team refers to main group of students consisted of students who have different knowledge, race, sex, and family background. Home team is the mixture of different skills. Expert team means a group of students consisted of different home team who have duty to learn and deepen certain material and finish all of tasks related to the topic, so then they have to explain to their home team.

The members of different home team get together by same topic in a group called expert team to discuss and elaborate the material that lead to help each other to understand fast. After discussion finished, they then get back to their home team and tell their teammate about what have been discussed in expert team. This cooperative learning method is designed to enhance students' accountability and positive dependence to each other in their own group. At the end of the learning process, students are tested through quiz covering all material taught. The key of jigsaw is the students' interdependence to the group members that will give needed information which can be useful to get quiz done well.

The main procedure of jigsaw model is (1) job distribution, (2) determine the expert team, (3) discussion section, (4) quiz. Furthermore, the detail procedure of jigsaw is (a) reading: students get the topics and read them all to gain information; (b) discussion of expert team: students with same topic meet and discuss together about their topic; (c) discussion: expert team get back to their own home team to explain what have been discussed in expert team; (d) quiz: students have to get quiz done covering all topics, and (e) group reward: the calculation of group score dan determination of group rewards.

Two Stay Two Stray (TSTS) was developed by Spencer Kagan (1992) and used cooperatively with number head together. This method is commonly used for all subjects and students' level. This method enables the students to share information to the other groups. The procedure of TSTS is (a) students work together in a group of four, (b) after finished, two member from each group stray to two other groups, (c) two member stayed have job to share their work and information to those who come to their group, (d) the two strayed members get back to their own group and report what they have found, and (e) the groups match and discuss their work.

Students Teams Achievement Division (STAD) was developed by Robert Slavin et all from University of John Hopskin. This method is the simplest cooperative learning method. This method also works based on a study group of heterogenous students (different sex, achievement, race, etc), listing new information to students. The STAD procedure is (a) form a group of four or five, (b) teacher explains material; (c) teacher gives task to students, (d) teacher gives quiz to all students, the students may not help each other to answer questions, (e) evaluation, and (f) conclusion. The advantages of STAD are (a) all students are more ready, (b) train cooperation well. However, there is a shortcoming of this model, namely all group members may feel difficult.

The mastery of Indonesian, English, and Science is used as level, to differ students' achievement who taught under cooperative learning model; jigsaw, TSTS, and STAD. The result shows that math has positive and significant effect on students' achievement in leraning Indonesian, English, and Science. In other words, students' math achievement will always be in line with the improvement of language and Science achievement of students. In construing the result, level in this experimental research designed factorial 3x3 becomes the standard measurement to determine the dependent variabel as analysis unit.

METHOD

The population of this research is all ten grades students of eleven senior high schools in Kendari with the total number of students is 11.852. The sample used for this experiment are six schools, 18 classes with the total is 540 students who have been chosen randomly. The treatment design of research is presented in Table 1 below:

Table 1. The design of sample total under research of students' math achievement (Y) under cooperative learning model (factor Ai) and language (Indonesian, English) and Science ability (factor Bj)

Factor Ai / Factor Bj	A1 (Jigsaw)	A2 (TSTS)	A3 (STAD)	∑
B1 (Indonesian)	60	60	60	180
B2 (English)	60	60	60	180
B3 (Natural Science)	60	60	60	180
∑ :	180	180	180	540

Description:

Sample consisted 540 students covers: 180 students are being taught under Jigsaw, TSTS, STAD method (Ai), 180 students who also have certain level of language and Science ability (Bj), (A1B1): 60 students are a group of students who taught under cooperative learning model; jigsaw and Indonesian mastery; (A1B2): 60 students are taught by Jigsaw and Science mastery; (A1B3): 60 students are taught under jigsaw method and English mastery; (A2B1): 180 students are taught under STAD and Indonesian mastery; (A2B2): 60 students are treated by STAD method and Science mastery; (A2B3): 60 students are taught under STAD method and English mastery; (A3B1): 60 students are taught under TSTS method and Indonesian mastery; (A3B2): 60 students

are taught under TSTS method and Science mastery; (A3B3): 60 students are taught with TSTS method and English mastery.

Variables used in this research consists of dependent and independent variable, namely: (i) cooperative learning model (Ai) consists of jigsaw (A1), TSTS (A2), and STAD (A3); (ii) other independent variable which functions as level is language and Science mastery (Bj) consisted of mastery Indonesian (B1), Science (B2), and English (B3), (iii) dependent variable is students' math achievement after getting treated.

Besides cooperative learning model (Bj) functioned as independent variable, language and Science mastery are also administered as independent variable as well as a level in which the cell number is determined randomly. The random determination to every individual or respondent is mapped to be math achievement score functioned as analysis unit in experimental research designed factorial. Other prominent variable in this research is implicit self assessment covered in character lesson plan. Self assessment in this research is an instrument to track and find out the tendency of attitude, character behaviour of students during math teaching learning process, for example: to know honesty, appreciation, care, and cooperation owned by a group designed with three option statement, they are (i) yes answer with score 2, (ii) doubt choice (no choice) with score 1, (iii) no answer with score 0 (zero). The advantage of this kind of lesson plan is to find out the students' attitude tendency as early as possible through self-assessment to face their future better as young generation in order to do long term development regionally and nationally.

Instruments used in this research are: (i) an instrument to measure students' math achievement, (ii) an instrument for self assessment that has been legally confirmed by experts. Expert evaluation is based on expert evaluation format with some criteria: (1) the suitability between indicator and variable, (2) the relevance between every question on test/ non-test and indicator as well as variable, (3) use correct and appropriate Indonesian, and (4) it is not ambiguous. The detail suitability between question item and indicator or dimension are: (i) score 1: if there is no criteria existed in the statement, (ii) score 2: if there is only one criteria existed in the statement, (iii) score 3: if there are only two criteria appeared in the statement, (iv) score 4: if there are only three criteria appeared in the statement, and (v)score 5: if in the statement, all criteria appear (Maonde, 2014:106). The needed experts to determine the validity of instrument are 20 people using Aiken pattern below:

$$V = \frac{\sum ni|i - lo|}{[N(c-1)]}$$

Where: i= from lo+1 to lo+c-1; ni= the number of score in i=1,2,3,4,5; N=∑ni; assessment scale from lo-c ... (Aiken, 1996:91). Score V is placed between 0 and 1, with score criteria involved if score V≥0.60, the test item is valid; otherwise it would be invalid.

Descriptive analysis is crucial to describe all variables' characteristic through respondents' responses observed towards average score of responses (μ) by using some syntax processes so as to create a group of or category of students' math achievement and the combination of factor Ai and Bj into cell factor (FS) under syntax process IF on SPSS package.

Inferential analysis technique in this research employs off the peg program called Eviews-7; the equation is Yi=$\sum_{k=1}^{K} C(k)Xk + \mu i \ldots (1)$; where Yi states an observation score variable i; C(k) refers to measurement model or independent variable coeficient Xk; Xk refers to the score of independent variables; μi means a random mistake from assumption model that has identical and independent standard normal distribution (NII) with E(μ)=0 and Var(μ)=σ^2or $\varepsilon_{ij} \sim$ NII(0,σ^2), as a constant value for all i=1, 2,3,...n (Agung, 2006: 88). To test all the hypothesis, the researcher used pattern (i) AC[(A,Y)|B=j] = $\pi_{1j} - \pi_{2j}$ for every j=1,2; (ii) AC[(A,Y)|A=i] = $\pi_{1j} - \pi_{2j}$ for every i=1,2,3; and (iii) difference in differences (DID)= $(\pi_{1j} - \pi_{2j}) - (\pi_{1j} - \pi_{2j})$; (Agung, 2011:166). This experimental research design based on Tables 1 and 2 is as follows:

R E T O1
R K • O2

Description: R= random; E=experiment; T=True experiment; K=control; O1= a test of students' math achievement in experimental class, and O2= a test of students' math achievement in control class.

Table 2. The design of math' achievement discrepancy based on factor Ai and Bj

Factor Ai / Factor Bj	A1 (Jigsaw)	A2 (TSTS)	A3 (STAD)	Difference: (A1 – A3)	Diffrence: (A2 – A3)
B1 (Indonesian)	μ_{11}=C(1)	μ_{12}=C(2)	μ_{13}=C(3)	C(1) – C(3)	C(2)-C(3)
B2 (English)	μ_{21}=C(4)	μ_{22}=C(5)	μ_{13}=C(6)	C(4) – C(6)	C(5)-C(6)
B3 (Natural Science)	μ_{31}=C(7)	μ_{32}=C(8)	μ_{33}=C(9)	C(7) – C(9)	C(8)-C(9)
Difference (B1 – B3)	C(1)-C(7)	C(2)-C(8)	C(3)-C(9)	**C(1)-C(3)-C(7)+C(9)[1]**	**C(2)-C(3)-C(8)+C(9)[3]**
Difference: (B2 – B3)	C(4)-C(7)	C(5)-C(8)	C(6)-C(9)	**C(4)-C(6)-C(7)+C(9)[2]**	**C(5)-C(6)-C(8)+C(9)[4]**

Description: [1] [C(1)=C(3)-C(7)+C(9)]: Discrepancy type 1 is average difference of students' math achievement for students taught under jigsaw and STAD by condition of Indonesian and Science mastery, [2] [C(4)-C(6)-C(7)+C(9)]: Discrepancy type 2 is average difference of students' math achievement for those taught by jigsaw and STAD by condition of English and sciemce mastery; [3] [C(2)-C(3)-C(8)+C(9)]: Discrepancy type 3 is average difference of students' math achievement for those taught by using TSTS and STAD by the condition of Indonesian and Science mastery, [4] [C(5)-C(6)-C(8)+C(9)]: Discrepancy type 4 is average difference of students' math achievement for those taught under TSTS and STAD with condition of English and Science mastery.

RESULTS and DISCUSSION

Students' math achievement in the research on senior high school education unit of Kendari, Southeast Sulawesi in 2014 empirically describes respondents characteristics through mean score (average), deviation standard, maximum and minimum score. As result analysis has been shown in figure 1, it is seen that mean score is 71.096; median=73.00; maximum score=92.00; minimum score=26.00; deviation standard=11.37; skewness=-1.086 and kutosis=4.33. Based on central tendency dispersion, it appears that students' tendency score of 540 respondents skew to the right side as can be seen below.

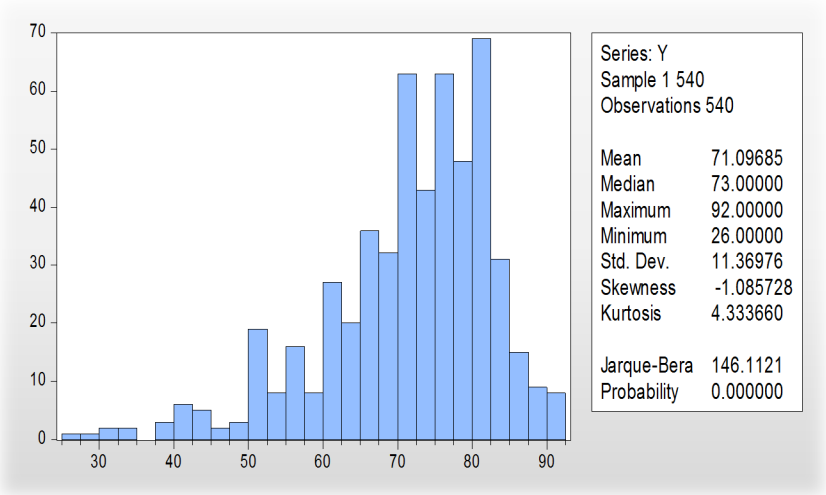


Figure 1. The histogram of students' math achievement in senior high school level after being treated by Jigsaw, TSTS, and STAD

Cross tabulation between cooperative learning model type and ability level of language and Science mastery as shown in table 4.2 confirms that jigsaw and the mastery of Indonesian, English, and Science are dominated by students from a group of students' math achievement type 4 by interval score (75≤Y, <85) with total number of 68 respondents and type 3 by interval score (75≤Y, <85) as many as 54 respondents. The dominant results come up from jigsaw and Indonesian mastery (A1B1) as many as 37 people followed by those taught under STAD model and Science mastery (A3B3) as many as 19 respondents, and the last, 12 students taught by TSTS and English mastery (A2B2). There was no meaningful problem occured during the implementation of jigsaw in classroom because of 22 (12.22%) or (4.07%) as whole. In other words, teaching learning process using cooperative learning model in which it was started by group work to enhance individual understanding in form of a knowledge that student oriented learning process is much better than direct teaching in spite of some shortcomings.

During the implementation of STAD with Indonesian, English, and Science mastery level, it is found that the group of students taught by STAD model with Indonesian mastery level (A3B1) on students' math achievement is dominated by type 4 with interval score (75≤Y, <85) as many as 68 students and type 3 with interval score (75≤Y, <85) as many as 59 students. The dominant result appear on STAD and indonesian mastery level (A3B1) as many as 42 students followed by English mastery level (A3B3) as many as 20 students, and the last is Science mastery level (A3B2) as many as 16 students. During STAD implementation, there was no prominent problem because of only 20 (11.12%) or (3.07%) of a whole. It means that student oriented learning process is more enjoyable for students than teacher oriented process in spite of some weaknesses.

Table 3. Cross tabulation between cooperative learning model cell factor (FC9) and 5 groups of students' math achievement

FC	Group of Learning Math Achievement					
	1.00 (Y<55)	2.00 (55≤Y<65)	3.00 (65≤Y<75)	4.00 (75≤Y<85)	5.00 (Y≥85)	Total
A1B1	0	1	11	**37**	11	60
A1B2	17	12	16	12	3	60
A1B3	5	7	27	19	2	60
Sub-tot.	22	19	**54**	**68**	16	**180**

A2B1	0	4	16	**36**	4	60
A2B2	2	18	19	16	5	60
A2B3	8	12	26	13	1	60
Sub-tot.	10	34	**61**	**65**	10	**180**
A3B1	0	0	17	**42**	1	60
A3B2	18	7	17	16	2	60
A3B3	2	10	25	20	3	60
Sub-tot.	20	17	**59**	**78**	6	**180**
Total	52	71	174	211	32	540

Inferential analysis is used to test a number of hypothesis after students getting treatment using jigsaw, TSTS, and STAD with the mastery level of Indonesian, English, and Science. For the detail, it can be seen below:

Hypothesis 1, the mean score of students' math achievement has positive and significant effect on Indonesian, English and Science ahievement. Statistical hypothesis applied was: $H_0 : \beta_i = 0$ versus $H_1 : \beta_i > 0$, with i=1,2,3. The analysis result gained are score t_{o1}=4.632; score t_{02}=4.875; score t_{03}=40.756 with score-p/2=0.000<α=0.05 which means that H_0 was rejected. Rejecting H_0 means that mean score of students' math achievement has positive and significant effect on Indonesian, English, and Science achievement. Each of those has estimated function (i): $\dot{Y}_{BIND}$=0.727+0.084MAT, (ii) $\dot{Y}_{BING}$=-0.312+0.098MAT and (iii) $\dot{Y}_{IPA}$=23.469+0.808MAT which means that the solely change in math learning process enhances the student's mastery in Indonesian as many as 0.084, English 0.098, and Science 0.808.

Hypothesis 2: discrepancy type 1 of mean score of math achievement based on English Science mastery ability (B1B3) by condition of jigsaw and STAD implementation. Statistical hypothesis needed are: H_0:[C(1)-C(3)]=[C(7)-C(9)] versus H_1: [C(1)-C(3)]≠[C(7)-C(9)]. According to Wald Test analysis in table 4, it is found that t-statistic=1.030308, df=531, p=0.3033>α-0.05, so H_0 is accepted. Accepting H_0 means that the discrepancy of students' math achievement does not have significant influence differences based on Science and language mastery level (B1B3) with a condition of jigsaw and STAD model.

Table 4. The result of hypothesis testing of discrepancy type 1

Wald Test:

Test Statistic	Value	df	Probability
t-statistic	1.030308	531	0.3033
F-statistic	1.061535	(1, 531)	0.3033
Chi-square	1.061535	1	0.3029

Null Hypothesis: C(1)-C(3)=C(7)-C(9)
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(1) - C(3) - C(7) + C(9)	2.650000	2.572046

Restrictions are linear in coefficients.

Hypothesis 3, the discrepancy type 2 of mean score of students' math achievement has signifficant difference according to English and Science mastery level (B2B3) with condition of TSTS and STAD type. Statistical hypothesis needed is H_0:[C(4)-C(6)]=[C(7)-C(9)] versus H_1: [C(4)-C(6)]≠[C(7)-C(9)]. According to Wald Test analysis in table 5, it is found that t-statistic=1.180967, df=531, p=0.2381>α-0.05, so H_0 is accepted. Accepting H_0 means that the discrepancy type 2 of students' math achievement does not have

significant influence differences based on Science and English mastery level (B2B3) with a condition of TSTS and STAD model.

Table 5. The result of hypothesis testing of discrepancy type 2

Wald Test:

Test Statistic	Value	df	Probability
t-statistic	1.180967	531	0.2381
F-statistic	1.394682	(1, 531)	0.2381
Chi-square	1.394682	1	0.2376

Null Hypothesis: C(4)-C(6)=C(7)-C(9)
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(4) - C(6) - C(7) + C(9)	3.037500	2.572046

Restrictions are linear in coefficients.

Hypothesis 4, the discrepancy type 3 of mean score of students' math achievement has signifficant difference according to English and Science mastery level (B2B3) with condition of jigsaw and STAD type. Statistical hypothesis needed is H_0:[C(2)-C(3)]=[C(8)-C(9)] versus H_1: [C(2)-C(3)]≠[C(8)-C(9)]. According to Wald Test analysis in table 6, it is found that t-statistic=0.276045, df=531, p=0.7826>α-0.05, so H_0 is accepted. Accepting H_0 means that mean score of students' math achievement does not have significant influence difference based on Science and English mastery level (B2B3) with a condition of jigsaw and STAD model. Discrepancy type 3 is the differences of students' math achievement.

Table 6. The result of hypothesis testing of discrepancy type 3

Wald Test:

Test Statistic	Value	df	Probability
t-statistic	0.276045	531	0.7826
F-statistic	0.076201	(1, 531)	0.7826
Chi-square	0.076201	1	0.7825

Null Hypothesis: C(2)-C(3)=C(8)-C(9)
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(2) - C(3) - C(8) + C(9)	0.710000	2.572046

Restrictions are linear in coefficients.

Hypothesis 5, the discrepancy type 4 of mean score of students' math achievement has signifficant difference according to English and Science mastery level (B2B3) with condition of TSTS and STAD type. Statistical hypothesis needed is H_0:[C(5)-C(6)]=[C(8)-C(9)] versus H_1: [C(5)-C(6)]≠[C(8)-C(9)]. According to Wald Test analysis in table 7, it is found that t-statistic=4.221024, df=531, p=0.0000>α-0.05, so H_0 is

rejected. Rejecting H_0 means that mean score of students' math achievement has significant influence based on Science and English mastery level (B2B3) with a condition of TSTS and STAD model.

Table 7. The result of hypothesis testing of discrepancy type 4

Wald Test:

Test Statistic	Value	df	Probability
t-statistic	4.221024	531	0.0000
F-statistic	17.81704	(1, 531)	0.0000
Chi-square	17.81704	1	0.0000

Null Hypothesis: C(5)-C(6)=C(8)-C(9)
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(5) - C(6) - C(8) + C(9)	10.85667	2.572046

Restrictions are linear in coefficients.

DISCUSSION

Empirically, the average of students' math achievement counted by mean, median, minimum, and maximum score, and also deviation standard results in: (i) mean=71.096, (ii) median=73, (iii) minimum score=26, (iv) maximum score=92, and (v) deviation standard=11.369, which indicates that the result of students' math achievement in histogram skews to the right side of mean score, that means cooperative learning model can increase the students' understanding on math.

The category of students' math achievement (Y) consists of five groups: (1) ($Y < 55$), (2) ($55 \leq Y < 65$), (3) ($65 \leq Y < 75$), (4) ($75 \leq Y < 85$), and (5) ($Y \geq 85$) as shown in tabel 3. The five groups were taught under cooperative learning model, namely jigsaw, TSTS, and STAD with certain mastery level of Indonesian, English, and Science.

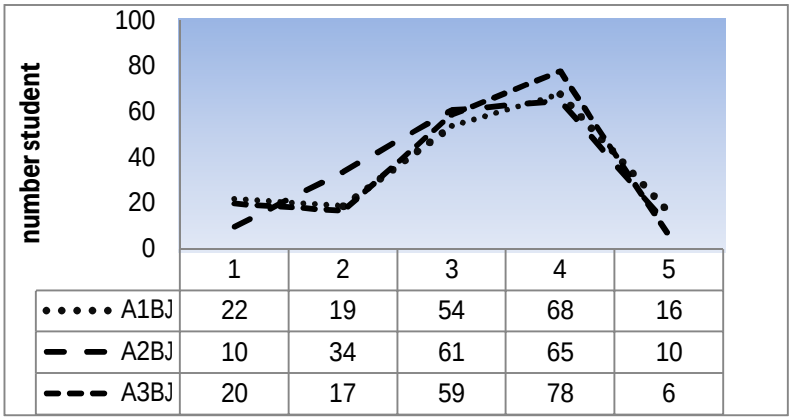
In jigsaw model with language and Science mastery level, it was found that the highest frequency goes to group 4 as many as 68 of 180 students (37.78%), followed by group 3 as many as 54 students (30%), while group 5 as many as 16 students (8.89%). The problem existed in this model, there are more students in group 1 as many as 22 and in group 2 for 19 students, each of them under condition of certain mastery level of Indonesian, English, and Science (Bj).

In TSTS model with language and Science mastery level, it was found that the highest frequency goes to group 4 as many as 65 of 180 students (36.11%), followed by group 3 as many as 61 students (33.89%), while group 5 as many as 10 students (5.56%). The problem existed in this model, there are more students in group 1 as many as 10 (5.56%) and in group 2 for 34 students (18.89%), each of them under condition of certain mastery level of Indonesian, English, and Science (Bj).

In STAD model with language and Science mastery level, it was found that the highest frequency goes to group 4 as many as 78 of 180 students (43.33%), followed by group 3 as many as 59 students (32.78%), while group 5 as many as 6 students (3.33%). The problem existed in this model, there are more students in group 1 as many as 20 (11.12%) and in group 2 for 17 students (9.44%), each of them under condition of certain mastery level of Indonesian, English, and Science (Bj).

Figure 2 presents the grouping of students' math achievement after being taught by three cooperative learning models; jigsaw, TSTS, and STAD with condition of certain mastery level of language and Science. Five groups are listed in one figure which empirically indicated the existence of interaction factor function

from the combination of cooperative learning models under condition of three level of Science and languages mastery. Kerlinger remarked that significant interaction occured when line intersection is between A1, A2, and A3 in group 1 and 2, group 2 and 3 between A2 and A1; group 3 and 4 between A1 and A2; group 4 and 5 between A2 and A3; however, if it is group 1 and 2 between A2 and A3, it would not be significant, as well as group 4 and 5 between A1 and A2.



	1	2	3	4	5
A1BJ	22	19	54	68	16
A2BJ	10	34	61	65	10
A3BJ	20	17	59	78	6

Figure 2. The grouping of students' math achievement according to three cooperative learning models; jigsaw (A1), TSTS (A2), and STAD (A3) with condition Bj.

Mathematic has positive and significant effect on students' achievement in Indonesian, English, and Science which contributes 0.084, 0.098, and 0.808 respectively. This result proves that math has close relationship to other subjects. This relationship is shown in psychology factors in studying, as what Arden N Frandsen (Suryabrata; 2002:236-237) said that factors motivating someone to study are: (i) they have high curiousity and sense to observe our wide world, (ii) they have creativity and willingness to do well, (iii) they have willingness to get sympathy of their parents, teachers, and peers, (iv) they have intention to arise from their failure and to do some new efforts, either in form of cooperation or competition, (v) there have been punishment or reinforcement as a result of study process.

Cognitively, learning math includes how the teacher transfers their knowledge to students as their main aim in teaching learning process. Every effort done to make their students understand about knowldge and skill given by their teacher in order the students can solve their own problems either in math or other subjects. If these efforts are success, then transfer process is success as well. Hence, it can be briefly said that transfer process relates to the well-organized math theory and concepts in our mind so as to solve or overcome any problems in the future. In regard to math learning process, there are three kinds of transfer process, namely formal discipline theory, identical unsures theory, and well-organized experience theory.

Formal discipline theory points out that thinking ability (remember, predict, analyze, synthesis, so on) can be trained. It is not about the material; training involving our mind is the most important. Basically, thinking development is through three ways: (i) construe lesson learns from experiences, (ii) strengthen our reasoning skill based on arguments made, (iii) develop comparation process. By these three ways, formal discipline eases transfer process towards problems in our life. For instance, if they develop reasoning skill in math, they will also be able to develop their logical thinking as well, and it leads to the development of reasoning skill for other subjects. The forms of formal discipline in math teaching have been related to theories and concepts, tasks, then those tasks become a kind of training for those theories and concepts mentioned previously. The way to do such tasks is similar to the given example. This situation makes

learning process does not have any benefit because students do not have chance to actively understand those concepts and theory. Eventhough the students are able to do the tasks correctly, it is possible that they actually memorized the way to do so as has been shown before. As Ausubel said that memorize is a meaningless mental activity. As learning process finished, the material taught will be forgotten as well. The experiments show that formal discipline has little effect on memory improvement.

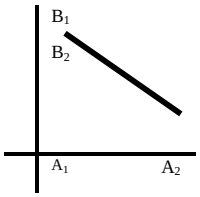
Identical unsures theory refers to connectionism theory which states that learning is a combination process of assosiation and stimulus (five sense stimulus and responses; the tendency to act). There is a strong relationship between stimulus (S) and response (R) if it is often trained. If S is given, there will be R. By training, R and S relationship will be automatic. Identical unsures are every unsure in assosiation field with every unsure (formed in our mind) so as to give the media to effectively learn something. These unsures are assosiated to be united that leads to a thing called skill. Every skill should be trained effectively and assosiated with other skills. For example, to be able to manipulate math symbols such as algebra, geometry, etc, students should be trained to do so. Manipulation skill will be really skillful through variety of trainings. However, direct training should also consider the students' interest and attitude.

The next is well-organized experience theory. Some cognitive-psychology experts are not the same boat with formal discipline theory, because they believe that human being react to the entire situation or structure more than certain part itself. They also points out that someone can understand every part of structure if they have already recognized the whole structure and understanding. They thus said that the entire function is bigger than the function of each structure part (Hudoyo: 1988; 102-103).

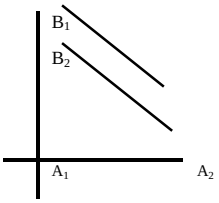
Math learning is close related to other subjects learning process, following math construction will be generalized to other subjects. As have been observed in this research, math has positive and significant effect on students' achievement in Indonesian, English, and Science.

Two or more factors interaction is interdependence between one factor and the others. in this research, two main factors; cooperative learning model Ai and mastery level of languages and Science are combination pair (i,j) where ij=1,2,3 and this combination symbolized by C(1), C(2).... C(9) are certainly interaction combination pairs A1,B1; A1,B2; A1,B3; A2,B1; ... A3,B3. This research construes combination pair C(k) with the certain other pairs C(k) or the combination of some pairs C(k) with the others C(k). In other words, combination pair in certain cell (ij) between cooperative larning type Ai (jigsaw, TSTS, and STAD) and mastery level of languages and Science Bj (Indonesian, English, and Science) has been really and meaningfully varied. These variation and variety are caused by the difference of mastery level of students in math as the analysis result above, in which the average score sweking to the right side if it is presented through graph.

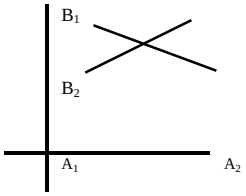
Kerlinger (2004:414) demontrates that interaction patterns in this experimental research among main factors if it is described in intersecting axial cross, and otherwise, there is no interactional factor as follow:



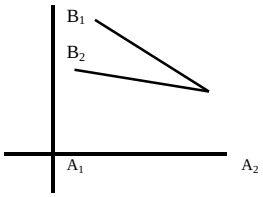
(a).Insignificant interaction (disordinal)



(b).Insignificant interaction (disordinal)



(c).Significant interaction (disordinal)



(d).Signficant interaction (ordinal)

CONCLUSIONS

Based on the result it was concluded that: (a) empirically, students' math achievement in senior high schools in 2014 tends to be better than previous research in junior high school in 2012 and in elementary school in 2013 by the mean=71, median=73, minimum score=26, maximum score=92, and deviation standard=11.37, under cooperative learning models; jigsaw, TSTS, and STAD with the certain mastery level of Indonesian, English, and Science; (b) math has positive and significant effect on students' achievement in Indonesian, English, and Science which contributes 0.084, 0.098, and 0.808 respectively. Having understood that every unit change in math will improve students' achievement in Indonesian, English, and Science, (c) discrepancy type 1, 2, and 3 has no significant effect on students' math achievement, which indicated that student oriented learning process through group work to enhance individual understanding who are not good at math and, (d) discrepancy type 4 has significant effect on students' math achievement, which means the combination pair of certain cooperative learning model and certain mastery level is more effective than other combination pairs to learn mathematic. Student oriented learning process is strongly recommended to be applied in variety of cooperative learning models for all subjects in education unit done by professional teachers to avoid any discrepancy of students' achievement. Every face to face interaction between teacher and students is expected to encourage students' interest in subjects taught by explaining long term benefit from certain subject.

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