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RESEARCH ARTICLE

THE EFFECT OF COMBINATION OF COOPERATIVE LEARNING MODEL, STUDENTS' CHARACTER BEHAVIOR AND SCHOOL LEVEL ON MATHEMATICS ACHIEVEMENT BY CONSIDERING COVARIATES OF PRIOR KNOWLEDGE AND ACHIEVEMENT MOTIVATION

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ABSTRACT

Experimental research design of factorial 3x3x2 with samples of 450 students of Senior High and Junior High Schools in Kendari, Southeast Sulawesi Province through covariance analysis (Ancova) was aimed primarily to analyze: (i) the effect of covariates of prior knowledge and achievement motivation depending on the prior knowledge towards mathematics achievement, (ii) the effect of adjusted mean of interaction of three factors $(A^* B^*C)_{ijk}$ by controlling various combinations of the two factors $((A^*B)_{ij}$, $(A^*C)_{ik}$, $(B^*C)_{jk})$ and the main factors Ai, Bj and Ck together or partially towards mathematics achievement on the number of hypotheses at significance level α = 0:05 based on the statistics F-Test and t-Test with the following conclusions: (1) empirically, them ean score of mathematics achievement after the implementation of the experiment had differences in supporting the proposed hypothesis, (2) covariates of prior knowledge and achievement motivation depending on the prior knowledge had significant effect on mathematics achievement, (3) the adjusted mean of interaction of three factors, interaction of two factors by controlling the main factors and covariates of prior knowledge and achievement motivation depending on the prior knowledge, all had significant effect on mathematics achievement.

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INTRODUCTION

Educational unit of Elementary School, Junior High and Senior High Schools is basic and middle education levels under the supervision of the ministry of education and culture that serves to maintain the quality of students' achievement in all disciplines. The government through the ministry of education and culture are looking for solutions on how to improve the quality of achievement. Not only this but also with different approaches and strategies, attitudes and behaviors become concern. It is indicated by the increasing of research cost in every year so that lecturers and researchers can freely carry out various studies of various models and designs to find the answer to the problems which arise namely the quality of achievement and attitudes of students in both junior high and senior high schools. On the other hand, the government also wants to combine with a variety of variables which have strong enough effect on students' achievement. The variables are combination of cooperative learning model, students' character behaviors toward mathematics, school level and covariates of prior knowledge and achievement motivation. Both of these covariates are internal factors of the students which explain that the more prior knowledge possessed by a student, the more effort a student make to add the existing knowledge on him or her. Because the basic to increase the prior knowledge has previously been in the memory or memories of the students, thus, if it is associated with covariates of achievement motivation, the students are more encouraged to find challenging problems in learning as a result, if the two covariates are incorporated in encountering learning, the slightest difficulty is not found, because the students have a strong foundation for the next learning material and the other side is supported by the desire to find out more things which are contained in achievement motivation.

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Prior knowledge and achievement motivation depending on the prior knowledge (x_1 x_1 * x_2) in this research are three choices of models of statistical analysis with respective design such as: (i) design: x_1 x_2 x_1*x_2, (ii) design: x_1 x_1*x_2 and (iii) design: x_2 x_1*x_2,in fact, the model used in accordance with the researcher's thinking was a model with design x_1 x_1*x_2. It indicates that mathematics achievement of Senior High and Junior High Schools students were effected by the prior knowledge and achievement motivation depending on the prior knowledge (x_1*x_2). The higher the students' prior knowledge in mathematics, the higher thepassion and motivation that comes from within the students to increase their knowledge.

Prior knowledge, according to constructivist views promoted by Vygostky and Piaget, and supported by the view of Bruner ((2006: 2), Ward (2013: 37)), learning is an active process in which learners construct an idea or a new concept based on the previous knowledge and current knowledge, students (learners) select and transform information, construct hypotheses and make decisions as references based on internal cognitive structure. Cognitive structure of Bruner is a network scheme that gives meaning and structure of the experience and makes the individual can establish what is already known in order to be continuous.

Dealing with the achievement motivation in teaching, according to Bruner's theory, teachers should attempt to encourage students to get their own finding principle; teacher and students must engage in active dialogue in order to produce a new invention. The teacher's role is very important in assisting the transformation process of any information to be studied in a proper format with the students' understanding.

Maonde (2010: 55) defines that learning is the accumulation process of teaching and learning (the learning process) carried out by teacher and students. A professional teacher hasno difficulty transferringhis or her existing knowledge to learners (students) while students who are not gifted in mathematics are getting smarter following learning due to teacher who is interesting in explaining any lesson. Teacher really knows the true condition of the students before undertaking learning process. This means that the teacher is able to interpret the condition of students before receiving the lesson. Students' conditions need to be known by teacher related to the methods and ways that will be applied by teacher in learning process. Learning-teaching is a process that contains a series of teacher's and students' actions on the basis of reciprocal relationships that take place in an educational situation to achieve the objectives that have been formulated in each applicable curriculum. The interrelationship between teacher and students is a primary condition for the learning process and it has a broader meaning, not just the relationship between teacher and students, but the form of educational interaction. In this case, not only deliveringmessages with the lesson, but also inculcating attitudes, arousing students' interest, spirit and values in learning process.

Many theories of learning that have been found by the experts through the experimental results and the most prominent are *Connectionesm Classical Conditioning* and *Operant Conditioning* (Syah, 2004: 92-99), the *Connectionesm* theory was first introduced by Thorndike based on experimental results which he did in the 1890s using animals especially a cat as the object of research to find out the phenomenon of learning. Based on the experimental results, he concluded that learningis the relationship between stimulus and response. Connectionism theory is also called "S-R Bond Theory" and *"S-R Psychology of Learning"*. This theory is also known as"*Trial and Error Learning*". This term indicates the length of time and number of errors in achieving a goal (Hilgard and Bower, (Syah, 2004: 93)). In this case, there are two main points which lead to the phenomenon of learning namely (i) the cat was hungry so that it tried to jump, scratched the door of the box and eventually made it out of the box. Had the cat's satiety, it would have not attempted to get out of the box to get food. So hunger is an impulse or cat'sresponse to try to get out getting food in the front of the box door, and (ii) the availability of food at the box door is a positive effect achieved by the response. This leads to the emergence of learning law called the law of effect. It means that ifthe response results a satisfactory effect, the relationship of stimulus and response will be stronger. Conversely, if the relationship is getting no satisfactory response then the relationship between stimulus and response is getting weaker. Law to learn is what inspired the concept of operant reinforcement theory conditioning Skinner findings.

Classical Conditioning theory, the theory was developed based on the results of experiments conducted by Pavlov, a great Russian scientist, which is basically a procedure of new reflex creation through bringing stimulus before the occurrence of the reflex. (Terrece, (Syah, 2004: 95)). Pavlov using dogs in his experiments aimed to determine the relationships between the conditioned stimulus (CS), unconditioned stimulus (UCS) conditioned response (CR), and unconditioned response (UCR). CS is the stimulation that can bring a learned response, while the learned response itself called CR. Besides, UCS is the stimulation that causes an unlearned response and the unlearned response is called UCR. Today, researchers in the education field begin to conduct experimental research through cooperative learning model or combination of cooperative learning model that is based on the constructivist theory. Social constructivism theory was developed by Lev Semyonovich Vygotsky (1896-1934). He considered that the role of culture and society, language, and interactions are important in understanding how humans learn. Vygotsky assumed that knowledge is cultural; he had used a socio-cultural approach in his research with children as the samples. This approach can be briefly described as "cooperative" and "culture". Vygotsky proved that the development of individuals including thinking, language, making a reason process is the result of culture. This capability is developed through social interaction with others (especially parents and teachers); so the ability describes the knowledge gained from the culture. Vygotsky examined the development of children in the community and through interaction with others, he found that what is given and what is happening in the social environment (dialog, actions, and activities) help children learn, grow and develop due the nature.

In Vygotsky theory, Zone of Proximal Development (ZPD) is known as the most important. He said that the children in any field have a real degree of development which can be assessed by testing them individually. He then argued that there is

potential for rapid development in every field. The difference between the two is called the zone of proximal development. The zone means that the distance between the actual developmental level determined by problem solving itself and the level of potential development determined through problem solving that is guided by an adult or collaboration with more capable friends. This leads to the idea that assignments which are too difficult to work alone can be learned with guidance and assistance from adults or more expert friends, or others who are more familiar. Zone of proximal development includes a child's cognitive skills that arise during the process of maturation, and these skills can only be honed with the help of more skilled one. Vygostky explained that the restriction on the zone of proximal development cannot be fruitful without their interactive social support from friends and teacher.

Vygotsky suggested that if in a class, a person can be helped by more skilled one as a friend and teacher, the level of support will change. Also, when friends and teacher adjust their support based on the needs of the person, it may be able to improve the zone proximal development. The adjustment support process is called "scaffolding". Scaffolding means providing assistance to students to complete a task that he or she cannot accomplish alone. The examples of effective scaffolding can be found in the Constructivist Learning and Teaching (Johnson. D.W & Johnson, R. 2009). Cooperative learning model based on the existence of learners or students in its core is interdependence learning with one another in the group. The purpose of cooperative learning is creating a situation where individual success determined or influenced by the group's success. There are three objectives of cooperative learning which are very essential namely: (1) academic achievement, (2) the acceptance of individual differences, and (3) combination of social skills which are (a) Academic Achievement: (i) in a cooperative learning although it covers a variety of social goals and also it improves learners' academic achievements or other important tasks, (ii) cooperative learning can bring benefits to either learners in lower group or high group in which to work together completing academic tasks, (b) Acceptance of Individual Differences: (i) another goal of cooperative learning model is the widespread acceptance of different people based on their race, culture, social class, ability, and inability. (ii) cooperative learning provides opportunities for students from diverse backgrounds and conditions to work with each other to rely on academic tasks and through cooperative respect structures, students will learn to respect each other, and (c) Combination of Social Skills.
Students-centered learning (students oriented) and the teacher as a mediator, facilitator and learning resources in the learning called constructivist learning. Constructivist learning is an effort to educate students for specific learning occurs in a broad parameter and it is determined by intellegence. Piaget (Yamin; 2012: 10) explains that intelligence is a continuous ongoing process and it is always changing. The mechanism of individuals interacts with the environment at a specific time and a process constantly forms itself. Dewey (Yamin 2012: 11) argues that the school is a laboratory for students to the inquiry in overcoming problems of everyday life. Dewey pinpoints that in the learning process, learners should be given freedom of expressing opinions. Brown & Ciuffetelli Parker (2009) and Siltala (2010) discuss the five basic elements in cooperative learning. Freedom in learning takes place in the various types of learning models. Learning type that enables students to interact with each other is cooperative learning model. Cooperative learning model has several types. The types of cooperative learning model that can build self-confidence of students and encourage their participation are cooperative learning model of Think-Pair-Share (TPS), cooperative learning model of Two Stay Two Stray (TSTS), cooperative learning model of Student Team Achievement Division (STAD) and cooperative learning model of Jigsaw. Model of various types of cooperative learning in experimental research having significant effect have been stated by Sahidin & Muliani (2010: 20); Tiya & Sufiana (2011: 31-32); Ismaimuza (2011: 11-20); Lasingga (2011: 53-66); Maonde. et.al (2015a: 141-159); Maonde (2015b: 161-174); Maonde, Kristofferson & Zamsir (2016a: 8-27) and Maonde, Nurmuiza, and Sani (2016b: 78-97).

Research method

The experimental research design of 3x3x2 factorial was conducted in Kendari on Senior High and Junior High Schools students who were 1163 students that consist of (i) 15 classes of Senior High School and 525 students respondents, (ii) 19 classes of Junior High School and 638 respondents as the population in the second semester of academic year 2015/2016. Mean while, the samples of research were 25 respondents in each cell as the unit of analysis as described in Table 1 as follows:

Research Variables

The variables used in this research consist of 3 (three) independent variables namely (i) cooperative learning model; (ii) 2 (two) covariates variables and 1 (one) dependent variable detailed as follows: (i) combination of cooperative learning model (A*i) consists of cooperative learning model Jigsaw-STAD (A*1). TSTS- STAD types of cooperative learning (A*2) and TSTS type of cooperative learning model (A3); (ii) other independent variables which serve as character behaviorlevel (Bj) consisting of character behavior with indicators1-2 were believeableand appreciate (B1).

Indicators 3-4 were individual and social responsibilities (B2), and the character behavior with indicators 5-6 are fair and care (B3), and education levels of Senior High School (C1) and Junior High School (C2),(iii) the covariates variables of prior knowledge of mathematics and achievement motivation (iv) the dependent variable was mathematics achievement (Y) obtained by random after the implementation of the experiment.

Analysis Techniques

Descriptive Analysis: it is needed to describe characteristics required for all variables considered or variables used by respondents with the mean score (μ) and standard deviation for each cell based onthe combination of cooperative learning model Ai, students' character behavior Bj and level of school Ck through SPSS/PC program.

Table 1. The number of samples in the implementation of experimental design 3x3x2 factorial in each cell based on factors Ai, Bj and Ck with covariates X_1 and X_2

		Factor C	**C1 (Senior High School)**			**C2 (Junior High School)**			**Total (Σ)**		
Factor A/B			**X1**	**X2**	**Y**	**X1**	**X2**	**Y**	**X1**	**X2**	**Y**
A*1 (Jigsaw-STAD)	B=1 (High Character)		25	25	25	25	25	25	50	50	50
	B=2 (ModerateCharacter)		25	25	25	25	25	25	50	50	50
	B=3 (Low Character)		25	25	25	25	25	25	50	50	50
A*2 (TSTS-STAD)	B=1 (High Character)		25	25	25	25	25	25	50	50	50
	B=2 (Moderate Character)		25	25	25	25	25	25	50	50	50
	B=3 (Low Character)		25	25	25	25	25	25	50	50	50
A3 (STAD)	B=1 (High Character)		25	25	25	25	25	25	50	50	50
	B=2 (Moderate Character)		25	25	25	25	25	25	50	50	50
	B=3 (Low Character)		25	25	25	25	25	25	50	50	50
		Total (Σ) :	225	225	225	225	225	225	**450**	**450**	**450**

Notes: The planned samples in each cell as the unit of analysis are described in Table 1 with the amount of each column was 225 students that consists of each cell was 25 respondents to the treatment of 3x3x2 factorial so that the sample size for the combination of cooperative learning model Ai (i = 1,2,3) and level Bj (J = 1,2,3) as well as level Ck (k = 1,2), were respectively 25 students, thus the total sample was 450 students taken randomly.

Table 2. Description of mathematics achievement after treatment of combination of cooperative learning model, students' character behavior on senior high and junior high schools students in Kendari, Southeast Sulawesi Province in 2015/2016

Ai	Bj	Ck	Mean	Std. Deviation	N	Ai	Bj	Ck	Mean	Std. Deviation	N
1.00	1.00	1.00	8.2720	.36999	25	3.00	1.00	1.00	6.7960	.25573	25
		2.00	7.5320	.41203	25			2.00	6.7520	.26476	25
		Total	7.9020	.53842	50			Total	6.7740	.25858	50
	2.00	1.00	7.1920	.58017	25		2.00	1.00	6.7480	.26160	25
		2.00	7.4320	.51374	25			2.00	6.7680	.26096	25
		Total	7.3120	.55573	50			Total	6.7580	.25880	50
	3.00	1.00	7.1760	.39081	25		3.00	1.00	6.7640	.25801	25
		2.00	6.7240	.65018	25			2.00	6.7680	.26096	25
		Total	6.9500	.57791	50			Total	6.7660	.25683	50
	Total	1.00	7.5467	.68538	75		Total	1.00	6.7693	.25573	75
		2.00	7.2293	.63942	75			2.00	6.7627	.25878	75
		Total	7.3880	.67949	150			Total	6.7660	.25642	150
2.00	1.00	1.00	6.5040	.62013	25	Total	1.00	1.00	7.1907	.89290	75
		2.00	7.5040	.57335	25			2.00	7.2627	.56276	75
		Total	7.0040	.77748	50			Total	7.2267	.74468	150
	2.00	1.00	7.5280	.50043	25		2.00	1.00	7.1560	.56215	75
		2.00	7.4840	.53827	25			2.00	7.2280	.55618	75
		Total	7.5060	.51484	50			Total	7.1920	.55846	150
	3.00	1.00	7.5240	.49773	25		3.00	1.00	7.1547	.49927	75
		2.00	7.5560	.48826	25			2.00	7.0160	.62017	75
		Total	7.5400	.48823	50			Total	7.0853	.56538	150
	Total	1.00	7.1853	.72218	75		Total	1.00	7.1671	.67113	225
		2.00	7.5147	.52805	75			2.00	7.1689	.58806	225
		Total	7.3500	.65177	150			Total	7.1680	.63026	450

Table 3. Result of effect of prior knowledge (X1) and achievement motivation analysis depending on prior knowledge (X1*X2) jointly on mathematics achievement

Dependent Variable: Y

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	117.330(a)	2	58.665	429.714	.000	.658
Intercept	77.330	1	77.330	566.434	.000	.559
X1	1.533	1	1.533	11.232	.001	.025
X1 * X2	14.003	1	14.003	102.573	.000	.187
Error	61.025	447	.137			
Total	23299.455	450				
Corrected Total	178.354	449				

a R Squared = .658 (Adjusted R Squared = .656)

***Inferential Analysis*:** inferential analysis is used to test hypotheses using ready-made program, SPSS/PC namely: (i) $\mathbf{Y_i=\beta_0+\beta_1X_1+\beta_2X_2+\beta_3(X_1*X_2)+\varepsilon_i;}$ where: Yi, the mean score of students' achievement; β_0 is a constant; β_1, β_2, and β_3 are the parameters estimation; X_1 is a covariate variable of student's prior knowledge; X_2 is the achievement motivation covariates X_1*X_2 is interactions factor and εi is a random error rate estimated by the least squares method (*Ordinary Least Square*), (ii) covarians analysis (ANCOVA) of three factors with a common equation as follows:

$Y_{ijkl} = \mu+A_i +B_j+ C_k+(AB)_{ij}+(AC)_{ik}+(BC)_{jk}+(ABC)_{ijk}+Kov(Xi) + \varepsilon_{ijkl}$; … (2)

Where**:**

Y_{ijk}: the univariate observation in the cell (i, j, k) formed by i-thrate of factor A level, j-thrate of level of factor B and k-thrate of factor C level.

μ: the overall average response parameter vector mathematics learning outcomes.

Ai:the treatment of cooperative learning model of Jigsaw-STAD (A*1), cooperative learning model of TSTS-STAD (A*2) and cooperative learning model of STAD (A3).

Bj:the behavior of character (Bj), the behavior of high-character group (B1), the behavior of the middle-character group (B2) and the behavior of low-character group (B3).

Ck: the education level with Senior High School (B_1) and Junior High School (B_2).

$(AB)_{ij}$, $(AC)_{ik}$, $(BC)_{jk}$: the effect of the interaction of two factors Ai.Bj and Ck in the cell (i,j,k).

$(ABC)_{ijk}$: the effect of the interaction of three factors Ai, Bj and Ck terms: ΣΣΣ (ABC) ijk = 0.

Cov(Xi): covariates of prior knowledge (X_1) and achievement motivation (X_2)

εijk: random error k-thrate of the model assuming εijk ~ NII ($0.\sigma^2$) with i = 1, 2, 3; j = 1,2,3 and k = 1 and 2; l = 1,2,3 ... 540 ... Agung (2006: 306).

ANALYSIS RESULTS AND DISCUSSION

Descriptive Analysis

The results of descriptive analysis of the mean score of mathematics achievement in general after treatment of combination of cooperative learning model, **character behavior**, school level are presented in Table 2 as follows: (i) the mean score of mathematics achievement for students taught by the combination of cooperative learning model of Jigsaw-STAD (A*1), behavior of high-character category (B1), Senior High School (C1) in each cell with mean score of 8,272 was higher than students of Junior High School was 7,532 with each standard deviation of 0.36999 and 0.41203 were also higher than the group of students taught by the combination of TSTS-STAD types (A*2), the behavior of high-character (B1) and the group of students taught cooperative learning model of STAD (A3) (as a comparison), behavior of high-character category (B1) on students of Senior High and Junior High Schools with a sample of 25 students in each cell, with the combination of TSTS-STAD types (A*2), the behavior of high-character (B1) and the group of students taught by cooperative learning model of STAD (A3) (as a comparison),also the behavior of high –character category (B1) on students of Senior High and Junior High Schools with samples of 25 students.

The mean score of mathematics achievement for students taught by combination of Jigsaw-STAD types, character behavior (high, medium and low (Bj)) levels (Ck) was relatively higher than combination of TSTS-STAD types, likewise on cooperative learning model of STAD show edrespectively 7.3880; 7.3500 and 6.7660 with respective standard deviation were 0.67949; 0.65177 and 0.25645,and samples of 150 students. Meanwhile overall, the mean score of mathematics achievement of combination of TSTS type was higher than combination of Jigsaw-STAD types in which 7.54 was higher than 7.38. The mean score of prior knowledge covariate (X_1) was 6.54, minimum was 5.00 and maximum was 8.50, standard deviation was 0.804 and achievement motivation (X_2) was 180.18,minimum was 100.00,maximum was 240.00 and standard deviation was 29.189.

Inferential analysis

Inferential analysis is used to test the number of required hypotheses detailed as follows:

Hypothesis-1. Covariates of prior knowledge (X1) and achievement motivation depending on the prior knowledge (X_1*X_2) together had significant effect on mathematics achievement. The statistical hypotheses are: (1) H_0: $X_1 = X_1 * X_2 = 0$ versus H_1: otherwise. The results of the analysis in Table 3 *corrected model* rows based on the statistical values of F-Test obtained F= 419.714; df = 2/447 with p-value = 0.000 <α = 0.05, indicated that H_0 was rejected. The rejection of H_0 can be concluded that the covariates of prior knowledge (X_1) and achievement motivation depending on the prior knowledge (X_1*X_2) together had significant effect.

Hypothesis-2. The covariates of prior knowledge (X_1) and achievement motivation depending on the prior knowledge (X_1*X_2) partially had significantly positive effect on mathematics achievement. The statistical hypotheses are: (1) H_0: $\beta_1 \leq 0$ versus H_1: $\beta_1 > 0$ and (2) H_0: $\beta_2 \leq 0$ versus H_1: $\beta_2 > 0$. The results of the analysis in Table 4 rows X_1 and rows X_1*X_2 based on statistics t-Test with value-t_{X1} = 3,351 with p-value = 0.001 <α = 0.05 and value-t_{X1*X2} = 10.128 with p-value = 0.000 <α = 0.05, indicated that H_0 was rejected. With the rejection of H_0 can be concluded that partially independent variables of prior knowledge (X1) and achievement motivation depending on the prior knowledge (X_1*X_2) had significantly positive effect on mathematics achievement. Through the regression equation Y^ = 4560 + 0161 (X_1) + 0.001 (X_1*X_2) respectively had significantly positive effect on mathematics achievement.

Hypothesis-3. The adjusted mean of three factors $(A*B*C)_{ijk}$ and two factors ($(A*B)_{ij}$, $(A*C)_{ik}$ and $(B*C)_{jk}$) considering the main factors Ai, Bj, Ck as well as prior knowledge covariate variable (X1), achievement motivation depending on the prior knowledge (X_1*X_2) together had significant effect on mathematics achievement. The statistical hypothesis is: H_0: $(A*B*C)_{ijk} = 0$ versus H_1: otherwise.

Table 4. Result of effect of prior knowledge (X_1) and achievement motivation analysis depending on prior knowledge (X_1*X_2) partially on mathematics achievement

Dependent Variable: Y

					95% Confidence Interval		
Parameter	B	Std. Error	t	Sig.	Lower Bound	Upper Bound	Partial Eta Squared
Intercept	4.560	.192	23.800	.000	4.184	4.937	.559
X1	.161	.048	3.351	.001	.067	.256	.025
X1 * X2	.001	.000	10.128	.000	.001	.002	.187

Table 5. Result of effect of all independent variables analysis jointly on mathematics achievement Dependent Variable: Y

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	148.029(a)	19	7.791	110.473	.000	.830
Intercept	95.747	1	95.747	1357.655	.000	.759
A	3.344	2	1.672	23.709	.000	.099
B	2.643	2	1.322	18.741	.000	.080
C	.026	1	.026	.374	.541	.001
A * B	19.713	4	4.928	69.881	.000	.394
A * C	2.542	2	1.271	18.023	.000	.077
B * C	1.793	2	.896	12.710	.000	.056
X1	1.792	1	1.792	25.417	.000	.056
X1 * X2	18.864	1	18.864	267.487	.000	.384
A * B * C	5.091	4	1.273	18.046	.000	.144
Error	30.325	430	.071			
Total	23299.455	450				
Corrected Total	178.354	449				

a R Squared = .830 (Adjusted R Squared = .822)

Table 6. Results of interaction effect of three factors (A*B*C) analysis considering the effect of covariates X_1 and X_1*X_2 jointly on mathematics achievement

Dependent Variable: Y

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	148.029(a)	19	7.791	110.473	.000	.830
Intercept	95.747	1	95.747	1357.655	.000	.759
X1	1.792	1	1.792	25.417	.000	.056
X1 * X2	18.864	1	18.864	267.487	.000	.384
A * B * C	30.699	17	1.806	25.606	.000	.503
Error	30.325	430	.071			
Total	23299.455	450				
Corrected Total	178.354	449				

a R Squared = .830 (Adjusted R Squared = .822)

Table 7. Results of effect of interaction of three factors (A*B*C) analysis considering the effect of covariates x_1 and x_1*x_2on mathematics achievement

Dependent Variable: Y

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	148.029(a)	19	7.791	110.473	.000	.830
Intercept	95.747	1	95.747	1357.655	.000	.759
A	3.344	2	1.672	23.709	.000	.099
B	2.643	2	1.322	18.741	.000	.080
C	.026	1	.026	.374	.541	.001
X1	1.792	1	1.792	25.417	.000	.056
X1 * X2	18.864	1	18.864	267.487	.000	.384
A * B * C	28.186	12	2.349	33.306	.000	.482
Error	30.325	430	.071			
Total	23299.455	450				
Corrected Total	178.354	449				

a R Squared = .830 (Adjusted R Squared = .822)

Table 8. Result of adjusted mean of three factors (A*B*C) analysis considering the effect of two factors interaction (A*B), covariates X_1 and X_1*X_2 on mathematics achievement

Dependent Variable: Y

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	148.029(a)	19	7.791	110.473	.000	.830
Intercept	95.747	1	95.747	1357.655	.000	.759
X1	1.792	1	1.792	25.417	.000	.056
X1 * X2	18.864	1	18.864	267.487	.000	.384
A * B	21.891	8	2.736	38.800	.000	.419
A * B * C	9.289	9	1.032	14.635	.000	.234
Error	30.325	430	.071			
Total	23299.455	450				
Corrected Total	178.354	449				

a R Squared = .830 (Adjusted R Squared = .822)

Table 9. Result of effect of three factors interaction (A*B*C) analysis considering the effect of two factors interaction (A*C), covariates X_1 and X_1*X_2 on mathematics achievement

Dependent Variable: Y

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	148.029(a)	19	7.791	110.473	.000	.830
Intercept	95.747	1	95.747	1357.655	.000	.759
X1	1.792	1	1.792	25.417	.000	.056
X1 * X2	18.864	1	18.864	267.487	.000	.384
A * C	6.296	5	1.259	17.855	.000	.172
A * B * C	26.987	12	2.249	31.888	.000	.471
Error	30.325	430	.071			
Total	23299.455	450				
Corrected Total	178.354	449				

a R Squared = .830 (Adjusted R Squared = .822)

Table 10. Result of interaction of three factors (A*B*C) analysis considering the effect of two factors interaction (B*C), covariates X_1 and X_1*X_2 towards mathematics achievement

Dependent Variable: Y

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	148.029(a)	19	7.791	110.473	.000	.830
Intercept	95.747	1	95.747	1357.655	.000	.759
X1	1.792	1	1.792	25.417	.000	.056
X1 * X2	18.864	1	18.864	267.487	.000	.384
B * C	4.077	5	.815	11.563	.000	.119
A * B * C	29.283	12	2.440	34.601	.000	.491
Error	30.325	430	.071			
Total	23299.455	450				
Corrected Total	178.354	449				

a R Squared = .830 (Adjusted R Squared = .822)

The results of the analysis in Table 5, line A*B*C based on the statistical values of F-Test obtained F-value = 18.046, df = (4/430) with p-value = 0.000 <α = 0.05, indicated that H_0 was rejected. The rejection of H_0 can be concluded that the adjusted mean of three factors (A*B*C) and two factors ($(A*B)_{ij}$, $(A*C)_{ik}$ and $(B*C)_{jk}$) by considering three main factors Ai, Bj and Ck, as well as covariates X_1, X_1*X_2 had significant effect on the mathematics achievement.

Hypothesis-4. The adjusted mean of three factors (A*B*C) considering the effect of covariates X_1 and X_1*X_2 had significant effect on the mathematics achievement. The statistical hypothesis is: H_0: $(A*B*C)_{ijk}$ = 0 versus H1: otherwise. The results of analysis in Table 6 line A*B*C based on statistics F-Test obtained F-value = 25.606, df = 17/430 with p-value = 0.000 <α = 0.05, indicated that H_0 was rejected. The rejection of H_0 can be concluded that the adjusted mean of three factors (A*B*C) considering covariates X_1 and X_1*X_2 had significant on mathematics achievement.

Hypothesis-5. The adjusted mean of three factors $(A*B*C)_{ijk}$ considering the main factors Ai, Bj, and Ck as well as covariates X_1 and X_1*X_2 had significant effect on mathematics achievement. The statistical hypothesis is: H_0: $(A*B*C)_{ijk}$ = 0 versus H_1: otherwise.

The results of analysis in Table 7, line A*B*C based on statistics F-Test obtained F-value = 33.306, df = 12/430 with p-value = 0.000 <α = 0.05,showed that H_0 was rejected. The rejection of H_0 can be concluded that the adjusted mean of three factors (A*B*C) of combination of cooperative learning model (Ai), behavior of character (Bj), school level (Ck) considering covariates X_1, X_1*X_2, the main factors Ai, Bj and Ck had significant effect on mathematics achievement.

Hypothesis-6. The adjusted mean of three factors (A*B*C) and two factors (A*B) considering covariates X_1 and X_1*X_2 had significant effect on mathematics achievement. The statistical hypothesis is: H_0: $(A*B*C)_{ijk}$ = 0 versus H_1: otherwise. The results of the analysis in Table 8, lines (A*B*C) based on statistics F-Test obtained F-values = 14.635, df = 9/430 with p-value = 0.000 <α = 0.05, showed that H_0 was rejected. The rejection of H_0 can be concluded that the adjusted mean of three factors (A*B*C) and two factors (A*B) by considering covariates $X_1$and X_1*X_2 had significant effect on mathematics achievement.

Hypothesis-7. The adjusted meanof three factors A*B*C and two factors (A*C) considering covariates X_1 and X_1*X_2 had significant effect on mathematics achievement. The statistical hypothesis is: H_0: $(A*B*C)_{ijk}$ = 0 versus H_1: otherwise. The results of analysis in Table 9, line A*B*C based on statistics F-test obtained F-value = 31.888 df = 12/430 with p-value = 0.000 <α = 0.05, showed that H_0 was rejected. The rejection of H_0 can be concluded that the adjusted mean of three factors (A*B*C) and two factors (A*C) considering covariates X_1 and X_1*X_2 had significant effect on mathematics achievement.

Hypothesis-8. The adjusted mean of three factors (A*B*C) and two factors (B*C) considering covariates X_1 and X_1*X_2 had significant effect on mathematics achievement. The statistical hypothesis is: H_0: (A*B*C) ijk = 0 versus H_1: otherwise. The results of analysis in Table 10, line A*B*C based on statistics F-test obtained F-value = 34.601, df =

12/430 with p-value = 0.000 <α = 0.05, indicated that H_0 was rejected. The rejection of H_0 can be concluded that the adjusted meanof three factors (A*B*C) and two factors (B*C) by considering covariates X_1 and X_1*X_2 had significant effect on the mathematics achievement.

DISCUSSION

Description of Mathematics Achievement, Students' Character Behavior ad School Level

The description of mean score of mathematics achievement after the implementation of the experiment 3x3x2 factorial on 18 observed cells namely starting from the cell-1 (A = 1, B = 1, C = 1) to the cell-18(A = 3, B = 3 , C = 2) found that the results varied on mathematics achievement. The variations of mean score of mathematics achievement were caused by several factors such as: (i) students who are from Senior High and Junior High Schools because the variations in the characteristics of respondents as seen from the behavior of character, character motivation and prior knowledge of mathematics. The behavior of character used by factor Bj (j = 1,2,3) in this research consisted of three categories namely the behavior of high, medium and low categories. On the other hand, the behavior of character of mathematics consisted of six indicators namely (1) believable indicator, (2) appreciation indicator, (3) individual responsibility indicator, (4) social responsibility indicator, (5) fair indicator and (6) care indicator. Each indicator was compiled ten statements to dig up how deep or meaningful extent to the answers given by the students to know the character of each respondent related to the behavior of the respondent at the time in undertaking the learning process in the learning groups.

The Effect of Covariates of Prior Knowledge (X_1) and Achievement Motivation Depending on Prior Knowledge (X_1*X_2) on Mathematics Achievement

Covariates of prior knowledge and achievement motivation depending on the prior knowledge of mathematics had significantly positive effect on mathematics achievement with contribution of 65.6%. It means that 65.6% variability on mathematics achievement was determined by covariates of prior knowledge and achievement motivation depending on the prior knowledge and the rest of 34.4% was determined by other factors in the population. Prior knowledge and achievement motivation are internal factors that directly influence the achievement in general and mathematics achievement. Achievement motivation depending on the prior knowledge means that achievement motivation follows prior knowledge possessed by each individual (student). Students who are essentially high knowledge will be followed by high motivation anyway. The level of basic knowledge students will be followed by the level of achievement motivation on mathematics achievement. Past experience is a very important thing as a stage in increasing the changes of the student. According to Slavin ((2011: 117), Ward (2013: 21)), the change is permanent, it means that the change is not executed directly, but through a systematic process of interaction and experience. The learning process occurs in three areas of competence, namely affective (behavior), psychomotor (skills), and cognitive (knowledge).

The Effect of Adjusted Mean of Three Factors Ai, Bj and Ck Considering Covariates X_1 X_2*X_2 towards Mathematics Achievement

The adjusted mean of three factors (A*B*C) through the main factors Ai, Bj and Ck considering interaction of two factors ((A*B), (A*C) and (B*C)) and covariates X_1 and X_1* X_2 design 3x3x2 factorial analyzed in 8 hypothesis wasthe most complete combination of statistical analysis of the interaction of three factors, because all factors were included in the model or design that was the analysis or maximum design which had been applied based on statistics F-test and t-test. The analysis showed that all hypotheses rejected the null hypotheses (H_0). The rejection of the null hypotheses (H_0) was caused by several factors such as: (i) the functioning of the two variables of covariates of prior knowledge mathematics and achievement motivation depending on the basic knowledge of mathematics are to eliminate the effect of internal factors of the students during the implementation of the experiment, and (ii) the functioning of the implementation of the combination cooperative learning model of STAD and Jigsaw-TSTS-STAD types as the treatment and STAD type of cooperative learning model as the controlsin the distinguishing characteristics of understanding and mastery of the learning material of mathematics of Senior High and Junior High Schools students level. The results of this research were not supported by the findings of Maonde, Lambertus & Meni (2016: 59-70) in which all four models, namely: (i) $Y_{ijk} = \mu + (AB)_{ij} + \varepsilon_{ijk}$; (ii) $Y_{ijk} = \mu + A_i + (AB)_{ij} + \varepsilon_{ijk}$; (iii) $Y_{ijk} = \mu + B_j + (AB)_{ij} + \varepsilon_{ijk}$ and (iv) $Y_{ijk} = \mu + A_i + B_j + (AB)_{ij} + \varepsilon$ijk; all of which had different effect was not significant. The model was the combination of cooperative learning model of Jigsaw-STAD, TSTS-STAD and STAD. This means that the mean score of mathematics achievement between groups of students who were treated compared with the relative control had no difference or at least had a very small difference or a group of students who are taught by the combination of cooperative learning model as the treatment of equally clever or stupid students. This finding was supported by research results of Maonde (2015b: 261-274).

Conclusion

- Empirically, the mean score of mathematics achievement of Senior High and Junior High Schools students after the implementation of the experimental combination of cooperative learning (Jigsaw-STAD, TSTS-STAD and STAD types), character behavior of students in mathematics learning categories (high, medium and low) had differenceinevery cell in supporting of the proposed hypothesis.
- Covariates of prior knowledge of mathematics (X_1) and achievement motivation depending on the prior knowledge of mathematics (X_1*X_2) jointly or partially based on statistics F-test and t-test at significance level α=5% had significant effect on mathematics achievement.
- The adjusted mean of three factor of combinations of cooperative learning model, the students' character behavior in mathematics learning and school level (A*B*C) considering the effect of covariates of prior

knowledge of mathematics (X_1) and achievement motivation depending on the prior knowledge of mathematics (X_1*X_2) alternately by considering the adjusted mean of the two factors ((A*B), (A*C) and (B* C)) including the three main factors Ai, Bj and Ck jointly or partially had significant influence on mathematics achievement.

Suggestions

- Functioning of covariates of prior knowledge of mathematics and achievement motivation depend on the prior knowledge in eliminating the effect of internal factors in the implementation of the experiment, the teacher are expected to ask the students' prior knowledge and achievement motivation before starting the learning process to measure the extent of our success in learning.
- Combine cooperative learning model in accordance with materials and subtopics which are taught to eliminate boredom within students, because the results of analysis and conclusions in this research can distinguish groups of students who like mathematics lesson with a group of students who do not like mathematics. However, through the implementation of cooperative learning model, the students' spirits are increased to complete each assignment of groups assigned by the teacher.

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