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WHY ARE THEIR MATHEMATICAL LEARNING ACHIEVEMENTS DIFFERENT? RE- ANALYSIS TIMSS 2015 DATA IN INDONESIA, JAPAN AND TURKEY

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Abstract
This study aims to describe students' mathematics achievement influencing factors in Indonesia, Japan, and Turkey at the student level and by school level with the use of TIMSS data 2015. The sample used in this study is the fourth grade of elementary school students from 3 countries participating in TIMSS 2015, namely Indonesia (N=3967), Japan (N=4307), and Turkey (N=5974). The findings indicated that there is no dissimilarity in mathematics learning achievement among students in Indonesia, Japan, and Turkey. The students' self-concept of mathematics proved itself a significant factor influencing their learning achievement across Indonesia, Japan and Turkey, while school climate factors only significantly affects the students' mathematics learning achievement in Indonesia and Turkey. The results also show the benefit of students mathematics self-concept to be formed or inculcated early (before elementary school) through positive school climate, because both have a positive contribution on student learning achievement in mathematics. In general, it can be concluded that the affective characteristics (student mathematics self-concept) and independent factors by the level of school (school climate) can only explain a small variance of achievement of student in learning mathematics.

Keywords: Mathematics, TIMSS, Multilevel Linear Model (MLM).

INTRODUCTION

TIMSS is a mathematics and science-based international assessment targeting elementary school fourth graders and of junior high school 8th graders. TIMSS has entered its sixth session after it was held in 1995, 1999, 2003, 2007 and 2011. TIMSS is a project organized by an international teamwork which is independent but work together with a national educational research institute devoted to improving the successfulness of education. TIMSS 2015 was followed by 70 countries, whereas in 2011, TIMSS was followed by only 63 countries. Countries around the world are participating in TIMSS activities because they are aware of the benefits of information from TIMSS results aimed at improving the education quality. For example, the 2011 TIMSS report provided important information that there were many factors that might affect student achievement, including student background, attitudes of student towards scientific subjects, teaching staff and educational workshop, and class characteristics (Mullis, 2013). It can be made clear that the utilization of TIMSS result is very helpful to the government in determining education policy which should be put forward to education quality.

The 2015 TIMSS results provided information that students in countries located in East Asian (Singapore, South Korea, Hong Kong, Taiwan, and Japan) had high learning scores of performance (Mullis et al., 2012). However, interesting information was obtained when achievement in mathematics along East Asia so that students affective factors, such as students' attitudes in

Japanese toward low mathematical achievement. In contrast, students from both grades in Indonesia and Turkey had shown a very high attitude toward mathematics. In grades 4 and 8, the achievement of students' mathematics learning achievement in both countries in TIMSS 2015 is inversely proportional, both of which are in 10 categories that are considered very low, either (Mullis et al., 2012). Meanwhile, some previous research results that also utilize TIMSS data precisely proved that student background and their affective factors, like self-concept, confidence, etc. have an effect on their mathematics learning performance. Moreover, it churns out that the students' mathematics learning achievement differences are also influenced by school factors, such as economic status, social and school culture, school climate, etc. (Lamb & Fullarton, 2002; Lüdtke et al., 2009). Therefore, students' mathematics differences in learning achievement across the three countries is indicated by the influence of factors linked to student and school.

Mathematics a obligatory subject in every school curriculum and has a very strong correlation with self-concept of mathematics (M-SC) (Antunes & Fontaine, 2007). M-SC is one's view of himself (Shavelson, Hubner, & Stanton, 1976). If associated with mathematics, M-SC can be meant as a person's view of his competence in mathematics. Self-concept becomes very important, because of its relationship with various academic results, one of which is achievement of students (Huang, 2011). High student mathematics achievement cannot be separated from the influence of students' attitudes toward positive mathematics (Caputo, 2015). Male students show self-concept that is higher in mathematics learning than female students, but the difference is not very significant (Antunes & Fontaine, 2007). Moreover, the students' self-concept in mathematics also knows a significant correlation with students' attitudes about mathematics (M-ATT) (Alkharusi, 2010). Hence, students' attiude, whether negative or positive attitudes, has relationship with students' M-SC.

Attitude is a person's intention to choose or dislike something, a person's tendency to engage or avoid an activity, a belief assumes a person's good or bad, and one's belief assumes something useful or useless (Neale, 1969). It can be understood that 3 components related to attitude, namely affective, cognitive, and behaviour (Can et al., 2017). In relation to mathematics, attitudes are more focused on student behaviour to accept or reject mathematics. Based on the relationship between students' attitudes toward student achievement is also positively significant (Alkharusi, 2009). Student attitudes are also part of contributing factors in explaining students' mathematics learning achievement (Mohamed, Mustafa, Lazim, & Hamdan, 2012). Therefore, the high-low level of students' mathematics learning achievement is associated with positive-negative students' attitudes, and high-low index of positive-negative attitude of students becomes the cause of high-low student mathematics' learning achievement.

There is no certain definition climate in school (SCM) (Boulifa & Kaaouachi, 2015). SCM can be interpreted as school effect, and also can be understood as class effect and teacher effect (Brault, 2004). SCM, however, can be illustrated through strict curriculum objectives, effective teachers, competent students, parents support, sense of security, and well- organized school (IEA, 2012). Climate of school is part of academic success. In addition, students who study in schools with a fair and friendly climate have a higher average achievement than students who study science in schools that have a negative climate (Mohammadpour, Shekarchizadeh, & Kalantarrashidi, 2015; Lubienski, Lubienski, & Crane, 2008). Relating to mathematics, students that obtain high mathematics learning achievement usually attend schools that emphasize academic success, whereas students who attend school with irregular and unsafe surrounding social atmosphere such as bullying have low mathematics learning achievement (IEA, 2012).

Research on self-concept and attitudes of student on mathematics has been done by previous researchers, but more specifically in 8th grade (TIMSS) and 15-year-old students (PISA). Previous research that tried to tie students' mathematics learning achievement with school factor also focused only on school socioeconomic status. In other words, research relating to affective factors and school factors that have impacts on mathematics learning achievement in 4th grade using multilevel analysis model is still rare, especially in Indonesia, Japan, and Turkey. Previous studies using multilevel models only used students' final scores provided by the TIMSS in the TIMSS database, whereas the research used the students' responses from non-test instruments (self-concept, student attitudes, and school factors) and tests (student learning achievement) and then re-analysed by the Generalized Partial Credit Mode (GPCM)l is also rarely done. The utilization of TIMSS data by most people is only used as a descriptive introduction in a conducted research,for example, to see the students' achievement position in mathematics, the average of achievement learning mathematics, student self-concept index, student attitude index, student confidence index, etc. However, there is one thing that needs to be studied which is the question of why students' mathematics learning achievement in every country of the three can be different.

Based on the research literature discussed above, there are obviously many factors indicated to have contributed in influencing student learning achievement in mathematics subjects, such as students' M-SC, students' M-ATT, and SCM. The aim of this research is to know the factors influencing student's achievement in learning mathematics in Indonesia, Japan, and Turkey, both at student level and at school level with the use of TIMSS data 2015. To answer the purpose, researcher makes some research question which will be answered in the discussion section, 1) "how much is inexplicable variance in students' learning achievement on mathematics subject in terms of differences within and between schools?", 2) "what are statistically predicting factors students' learning attainment in mathematics?", 3) "what is the strongest predictor of mathematical learning achievement relying on the final multilevel model?", and 4) "to which extent do the variables in the final multilevel model in 3 countries explain the overall variance in learning achievement of students in learning mathematics?".

METHODS

Sample

The research sample was the 4th graders of primary school from 3 countries which are members of TIMSS 2015, Indonesia, Japan, and Turkey. The three countries were chosen based on two reasons. First, these countries stood for a variety of education systems across the entire world. Second, the average mathematical score and student attitude index in these countries varies. The average mathematical score in Japan was above the equalized score set in the TIMSS International Benchmark Scores, but had a low index of mathematical attitudes. The two other countries, Indonesia and Turkey, had an average mathematics score below the levelled out score set in the TIMSS International Benchmark Scores, but both countries had a high index of mathematical attitudes. This sampling process can be dug out in TIMSS 2015 technical report (see TIMSS, IEA website).

Variable

Dependent Variable

The achievement of student mathematics learning in TIMSS 2015 involved three topics: numerics, geometry and measures, and display data (IEA, 2013). In the number topic, the tested material linked entire numbers, fractions and decimals, and expressions, simple equations, and relationships (IEA, 2013). Number of items used in the TIMSS to measure the mathematics learning performance of students' in 4^{th} grade consisted of 179 items. The questionnaire code used were M04, M05, and M06 (see the information table item, the IEA website).

Independent Variable by the Student level

Independent variables by the student level consisted of M-SC and M-ATT. The instrument used in TIMSS to measure students' M-SC consisted of four items with the following codes ASBM03A, ASBM03B, ASBM03C, and ASBM03D. The items about students' M-ATT consisted of nine items with codes ASBM01A, ASBM01C, ASBM01D, ASBM01F, ASBM01G, ASBM01H, and ASBM01I. The complete data can be checked in Student Questionnaires TIMSS 2015.

Independent School Level Variable
The school level independent variable was the SCM. The SCM in TIMSS 2015 was illustrated by academic success. Instruments of academic success were filled by the principal which consist of eighteen items with the following codes ACBG14BA, ACBG14BB, ACBG14BD, ACBG14BE, ACBG14BF, ACBG14BH, ACBG14BI, ACBG14BJ, ACBG14BH, ACBG14BK, ACBG14BL, and ACBG14BM. The complete data can be checked on the School Questionnaires (see TIMSS 2015 Context Questionnaires, IEA).

Data Analysis Techniques
This work concerned with an analysis of TIMSS 2015 secondary data from Indonesia, Japan, and Turkey. Data on students' mathematics learning achievement, students' M-SC, M-ATT, and SCM were re-analysed using IRT approach, called Generalized Partial Credit Model (GPCM) for polythomus data (2-PL). The 2-PL model consists of the difficulty level and the differentiated items. The data of the three countries were analysed simultaneously to produce an estimation of the ability or index on the same scale. The finding on students' mathematical ability, the students' M-SC, students' M-ATT, and SCM found were in theta (logit) formation ranged from -4 to +4. To be more easily understood, the estimation results were converted on a scale from 0 to 100 using the "Ability/Index_100= (12.5*Ability/Index/Theta) +50" equation. Furthermore, an analysis of multilevel models was begun assessing the value of ICC. ICC is used to see how much variance percentage is explained by other factors (school factor, teacher factor, family factor, etc.) that cannot get completely explained by student factors. Basically, multilevel modelling considers individual groupings, estimates the variation of dependent variables associated with within and between groups differences and identification of factors by every level in association with the reliant variable, regardless of SE of coefficient from regression (OECD, 2009; Steele, 2008; Woltman, Feldstain, & Mackay, 2012).

This study used two-level model or Two-Level Multilevel Model. At level-1 (student level), students' M-SC and students' M-ATT were included in model-1 determine how much variance was explained in within school and between schools, whereas at level-2, the differentiation within and between schools were identified through independent variables (predictors) in the environment found in the school (school level) by including variables which were significant at level-1 (student level) into model-2 (final model). The software program used was R.3.4.1 with the editor R-Studio.0.99.891.

FINDING

Descriptive Statistic
Before the foremost analysis, the researchers primordially used descriptive statistics for the comprehension of sample overview. Within Table 1 total number of schools, students, and average student achievement score of mathematics based on TIMSS 2015 data in Indonesia, Japan, and Turkey.

Tabel 1: The Mathematics Average Score

Countries	**N-School**	**N-Student**	**Mathematics Average Score**	**SD**
Indonesia	230	3967	46,96	11,23
Japan	148	4307	53,29	12,86
Turkey	228	5974	49,79	12,50

Table 1 depicts that based on TIMSS 2015 data, the mathematics average score of Indonesian students was lower than that of Turkish students. The mathematics average score of Japanese outweighs Indonesian and Turkish students.

Multilevel Model
This study used samples of different sizes as shown in Table 1. To avoid biased results, the samples within this research were clustered by school. If clusters are considered in estimating the proportion

of variance within dependent variable by independent variables, the findings can be more valid (Woltman, Feldstain, MacKay, & Rocchi, 2012). Therefore, this study used multilevel model with two-level in order that effect of variable by both school and student level is know when one wants to clarify the variance of students' learning performance in learning mathematics. Analyzing data began with the model without independent variables, (the null model, Step 1). Furthermore, it systematically moved toward a more complex model (step 2-3), which included the dependent variable by the level of both school and student, as argued by Hox (2010). The mathematical equations model of multilevel analysis model is included in the equation (1).

$$Y_{ij} = \beta 0_j + \beta_{1j}(SE)X_1 + \beta_{2j}(SE)X_2 + \beta_{3j}(SE)X_3 + \varepsilon_{ij} \quad (1)$$

Y is the dependent variable. X_1, X_2, and X_3 are independent variable (predictor). *i* is individual or student and *j* is group or school. β_0 is the average intercept, while β_1, β_2, and β_3 are coefficient of each predictor (*X*). *SE* is standard error and ε_{ij} is error or residual errors in the individual or student level. $\beta_{0j} = \beta_0 + U_{0j}$, where U_{0j} is students' errors in school level.

Step 1: null model

Intraclass Correlation Coefficient (ICC) is a comparison between the number of variation by the level of school with the amount of variance of student and school level. Table 2 indicates that 0.3% of the entire total variance (126.23) of students' mathematics learning achievement in Indonesia was related to differences in school level, 0% (165,489) for Japan, and 0% (156) for Turkey. The findings expound that the variability of achievement in mathematics learning between schools in those three countries was very small (see Figure 1). The variability in students' mathematics learning achievement due to the difference at the student level (within-schools) had a very large percentage, 99.7% of total variance for Indonesia, 100% for Japan, and 100% for turkey is concerned with differences in levels students. Therefore, it is necessary to conduct further analysis to determine the linkage between variables; variables connected to students, variables connected to school, and students' achievement in mathematics learning for every country using the multilevel approach.

Table 2: TheOutcomes of MLM for Fixed and Random Effect from Null Model

Negara	**Effect**	**Variable**	**Parameter Estimation**	**SE**	**ICC**
Indonesia	Fixed	Mathematics Score	46.941	0.185	0.003
	Random	Between School Variance	0.441	2.895	
		Within School Variance	125.789	0.686	
Japan	Fixed	Mathematics Score	53.295	3.566	2.2358E-23
	Random	Between School Variance	3.70E-21	3.7E-21	
		Within School Variance	165.489	3.566	
Turkey	Fixed	Mathematic Score	49.792	0.161	1.35E-10
	Random	Between School Variance	156.466	2.862	
		Within School Variance	2.12E-08	7E-08	

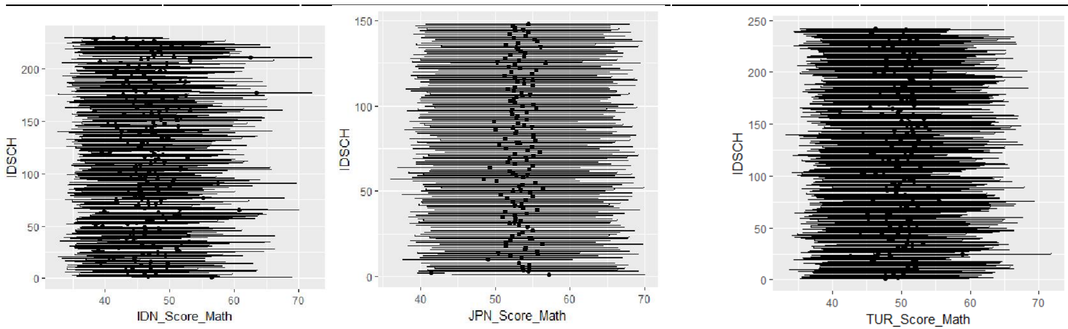

Figure 1: Students' Mathemathics Learning Achivement in Indonesia, Japan, and Turkey

Step 2: Add the Predictor Variables at the Student Level (Model 1)

Indonesia

Equation (2) is an equation constructed from the analysis results in model 1 displayed in Table 3. Equation (2) shows that of the both variables design in model 1, there was one insignificant variable which was variables connected to students' attitudes about learning mathematics. Hence, the attitudes of student on mathematical variables did not get used in the equation and also in the advanced analysis of model 2. Meanwhile, self-concept variables become statistically significant predictors and had a positive correlation with mathematics learning achievement. It can also be seen from the value of estimated coefficient value that is two times the SE (Gelman & Hill, 2007).

$$\theta_{Mathematics} = \beta_{0j} + 0{,}071(0{,}02)\ \theta_{M\text{-}SC} + e_{ij} \qquad (2)$$

In other words, students who had high self-concept of mathematics had better achievement than students who had low M-SC. In addition, it was found that after adding the student-level variables (M-SC and M-ATT) into model (1), By student level, unexplained variance dipped from 125.789 to 125.3 and 0.441 to 0.410 by the level school. The decrease can be understood that most of the variance of mathematics learning achievement at student and school level was explained by M-SC variable of student in model (1), while students' M-ATT explanation was significant because it did not significantly affect student learning achievement of mathematics. In general, model (1) could explain the overall variance with 0.4% , (126.23) in learning achievement of students. With much specification, the variables with significance in model (1) succeeded in explaining 6.8% of the overall variance (0.441) by the level of school and 0.38% (125,789) by the level of student. Of the two predictors included within the model (1), only the students' M-SC is the strongest and significant predictor of students' mathematics learning achievement in Indonesia.

Japan

In Japan, not all variables at student-level included in model (1) were significant predictors of students' mathematics learning achievement, as shown in (3) below:

$$\theta_{Mathematics} = \beta_{0j} + 0.131(0.022)\ \theta_{M\text{-}SC} + e_{ij} \qquad (3)$$

Simillar to Indonesia, students that have an advanced mathematics self-concept in Japan also have better achievement than students do not have advanced M-SC. Moreover, relying on the information obtained after adding the student-level variables (M-SC and M-ATT) into model (1), by the level of student, the unexplained variance dropped from 165.489 to 163.839 and 3.70E-21 (0.000) to 1.36 E-21 (0,000) at the school level. It means that most of the variance achievement in learning mathematics at by both level was explicated by students' M-SC in model (1), while students' M-ATT did not take part in the meaningful explanation, because it did not significantly affect students' achievement in learning mathematics. In general, the overall variance could be explained by model (1) at 1%, (2,235) in achievement of students in learning mathematics. More explicitly, the significant variables in model (1) successfully explained 63.2% of the overall variance (3.7E-21) by the level of school and 1% (165,489) at the student level. Of the two predictors included in model (1), only the students' M-SC was the strongest and most significant predictor of students' mathematics learning achievement in Japan.

Turkey

While in Turkey, the same results are also shown in model (1) as produced in model (1) in Indonesia and Japan. Equation (4) shows that not all variable by the level of student in model (1) was significant as a predictor of student's mathematics learning achievement. Students' M-SC was the only variable which is statistically significant, while student M-ATT had an estimated coefficient value which not twice greater than the standard error value (SE), so that it is not significant (Gelman & Hill, 2007; Steele, 2008b).

$$\theta_{Mathematics} = \beta_{0j} + 0.118(0.016)\ \theta_{M\text{-}SC} + e_{ij} \qquad (4)$$

Similar in Indonesia and Japan, Turkish student who had good mathematics learning achievement also had high mathematics self-concept, and vice versa. Furthermore, after adding the student-level variables (M-SC and M-ATT) into model (1), by student level, unexplained variance diminished from 156.466 to 154.540 and 2.12E-08 (0.000) to 3.12E-14 (0,000) by the level of school.

It means that M-SC of students in model (1) explained most of the mathematics learning variance achievement by student and school level, while student's M-ATT did not have impact on the meaningful explanation, because it did not significantly affect students' mathematics learning achievement. In general, model (1) could explain 1.8% of the overall variance (156) in the student's mathematics learning achievement. More specifically, the significant variables in model (1) succeeded in explaining 100% of the overall variance (2, 21E-08) by the school level and 1.2% (156,466) at the student level. Of the two predictors included in model (1), only the students' M-SC was the strongest and most significant predictor of students' mathematics learning achievement in Turkey.

Step 2: Add the Predictor Variables Connected to the level of school (Final Model)
Variables connected to the level of student involved in model (1) had not yet widely explained in the variance of students' mathematics learning achievement in Indonesia, Japan, and Turkey. Therefore, the new model should be created which consist of significant variables in model (1) and also add new variables connected to school level, namely school climate.

Indonesia
Equation (5) indicated that the most dominating variable within the model was the M-SC variable, as much as its estimated coefficient is the largest (b = 0.066). The latter was approximately four times the (SE = 0.017). It could be interpreted that the coefficient with positive value shows any students that has a high M-SC had high learning achievement of mathematics. In addition, the inclusion of SCM led to a decrease in baffling variance by the level of school from 0.411 to 0.027, indicating that about 93.9% of students' achievement differences in learning mathematics were explicated by school climate attended by students. After adding the M-SC and SCM variables included in the model (2) the results stayed constantly significant. This demonstrates that the variables designed in this model (2), M-SC and SCM explained the difference of students' mathematics learning achievement in Indonesia.

$$\theta_{Mathematics} = \beta_{0j} + 0.066(0.017)\,\theta_{M\text{-}SC} + 0.047(0.015)\,\theta_{SCM} + e_{ij} \quad (5)$$

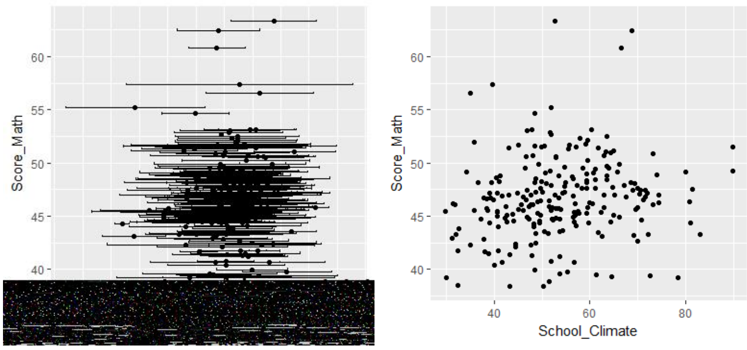

Figure 2(a) and (b): Math Self-Concept and School based Climate Students Indonesian

Figure 2 (a) is an overview of the self-concept index of 4th grade students in Indonesia attributed to their mathematics learning achievement. Figure 2 (a) shows that students with low self-concept math index also has low mathematics achievement scores. However, there are some students seen in Figure 2 (a) having a high self-concept mathematical index but having a low mathematics learning achievement score. Figure 2 (b) is a school climate index that is also connected with students' achievement in learning mathematics. Figure 2 (b) shows that students who frequent school with strict curriculum objectives, effective teachers, competent students, parents support, sense of security, and well- organized school have better performance scores than those who frequent school that do not reflect that.

Japan

In Japan, equation (6) indicates that the M-SC variable was a variable that remains significant with the coefficient of estimation(b = 0.104) with approximately seven times the SE of 0.016. This means that the coefficient with positive value shows that any student with high M-SC also had high mathematics learning achievement. In other word, the involvement of SCM variables did not contribute significantly. This can proven from the coefficient of estimation value (b = 0.022) which was approximately one standard error (SE = 0.019). In addition, the involvement of SCM variables also did not greatly reduce the unexplained variance bye the level of school, from 1.36E-21 to 1.10E-21. This shows that the M-SC variable completely explained the variance that could not be explained by the level of student and that of school. Therefore, significant variables in model (2), namely M-SC explained the learning achievement difference among students' in mathematics in Japan.

$$\theta_{Mathematics} = \beta_{0j} + 0{,}104(0{,}016)\ \theta_{M\text{-}SC} + e_{ij} \quad (6)$$

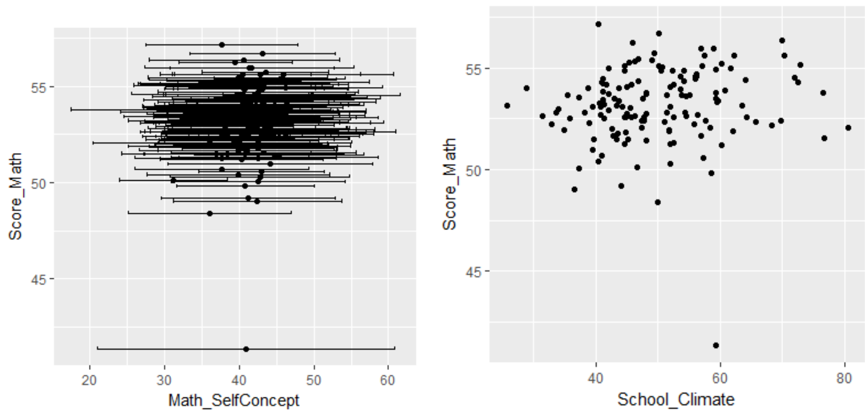

Figure 3 (a) and (b): Math Self-Concept and School Climate Students Japan

Figure 3 (a) is an overview of the self-concept index of 4th grade Japanese elementary school students from Japan that is related to their mathematics learning achievement score. Figure 3 (a) shows that students that have a high self-esteem index of mathematics also have high achievement scores of mathematics. Nevertheless, there are some students seen in Figure 3 (a) having a high self-concept mathematical index but having a low mathematics learning achievement score. Figure 3 (b) is a school climate index that is also connected with students' mathematics learning achievement. Figure 3 (b) shows that there is no difference in mathematics learning achievement among students in certain school that applying strict curriculum objectives, effective teachers, competent students, parents support, sense of security, and well- organized school with students attending school that do not reflect this.

Turkey

In Turkey, equation (7) demonstrates that the M-SC variable was a variable that remains significant as its coefficient of estimation ,(b = 0.115) with around nine times comparing to the SE whose value was 0.014. This means that the coefficient with positive value shows that whoever student with high M-SC also has high learning achievement of mathematics. Additionally, the involvement of SCM led to an unexplained decrease in variance by the level of school from 3.21E-14 to 1.31E-14, indicating that about 100% of the difference in mathematics learning achievement among the students was explicated by the school-based climate attended by students. After adding the M-SC and SCM variables within the model (2) the results remains significant. It proved that the variables involved in model (2), ie M-SC and SCM explained the dissimilarity in student's achievement in mathematics learning across Turkey is explained by.

$$\theta_{Mathematics} = \beta_{0j} + 0{,}115(0{,}014)\ \theta_{M\text{-}SC} + 0{,}073(0{,}012)\ \theta_{SCM} + e_{ij} \quad (7)$$

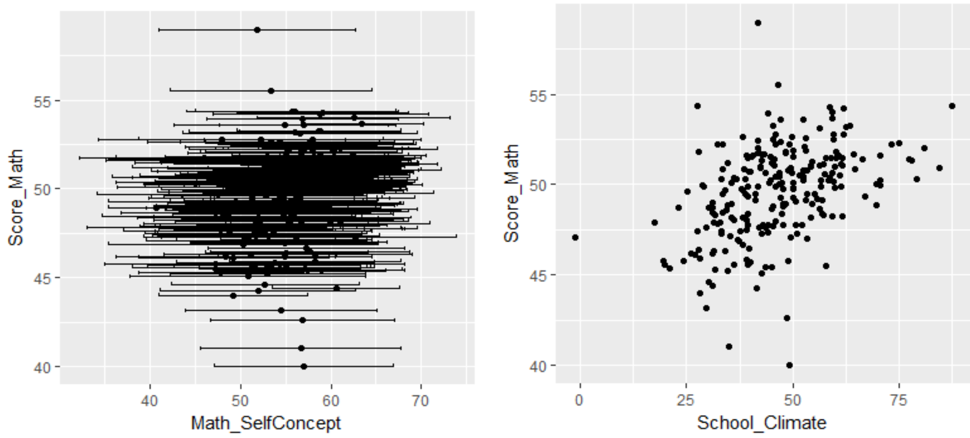

Figure 4 (a) and (b): Math Self-Concept and School Climate Students Turkey

Figure 4 (a) is an overview of the self-concept index of 4th grade of primary school students across Turkey attributed to their mathematics learning achievement. Figure 4 (a) shows that students that have a high level of self-concept math index also have high achievement scores of mathematics. Nevertheless, there are some students seen in Figure 4 (a) having a high self-concept mathematical index but having a low mathematics learning achievement score. Figure 4 (b) is a school climate index that is also related to with students' mathematics learning achievement. Figure 4 (b) shows that students that frequent school with strict curriculum objectives, effective teachers, competent students, parents support, sense of security, and well-organized school have better performance scores than students who regularly attend school that do not reflect that.

Final Model Interpretation

Table 3 is a summary of two stages of multilevel analysis which are model (1) and model (2) of three countries.

Indonesia

Considering the self-conceptual variables of mathematics student and school-related variables, the final multilevel model (model 2) only explains a small (0.6%) of the overall unexplained variance in mathematics learning achievement of student, as the entire variance decreases from 126.230 to 125.417. More specifically, this model only explains 0.3% and 93.9% of variance at student level (125,789) and school (0.441). The dimension of the variance that is too small by the level of school causes the variables present in model (2) to explain nearly 100% of the unexplicated variance by the level of school. In general, the researchers can conclude that this model with multilevel has an average match, since most of the significant variables in model (2) do not contribute in a significant way to explaining unexplained variance on differences in achievement of student in mathematics in Indonesia. Holding account on the formed coefficients within the last model, by making other variables constant, students that get a high M-SC also achieve better in mathematics than those with low M-SC with an increase of 0.066 in score. Furthermore, the score of students' mathematics learning achievement will increase by 0.047 for each additional SCM unit.

Japan

In other world, in Japan, of the two variables that exist within the model (2) there is only one variable that significantly affect the student's mathematics learning achievement. The variable is the students' M-SC which in the last model of multilevel (model 2) can only explain a small part (1%) of the total unexplained variance in achievement of students' mathematics learning, as far as there was a decrease in total variance, from 165,489 to 163,900. In specific way, the final model only explains 1% and 70.3% of variance at student level (165,489) and schools (3.7E-21). The size of the variance that is too small at the school level causes significant variables in model (2) to account for almost more than 50% of the variance not explicated at the level of school. In general, the researcher can conclude that this model with multilevel has an average match, since most of the significant variables in model (2) do not contribute in a significant manner to the unexplained variance of student differences in learning achievement in Japanese, especially at the student level. Considering the coefficients formed in the final model, students that get a high M-SC also perform better in learning mathematics than students with low M-SC, its score increases of 0.104.

Turkey

In Turkey, the result is not far much different from Indonesia. The final multilevel model (model 2) consisting of the students' M-SC and school-related variables explained only a small part (1.8%) of the total variation that is unexplained in students' achievement in learning mathematics, as the overall variance diminished from 156 to 154. More explicitly, the final model in Turkey only described 1.8% and 100% of variance at both students' performance and school level, (156,466) and (2.12E-08) respectively. The small size by school level variance caused variables presented in model (2) explained 100% of the variance of the school level which was unexplained before. In general, it is undoubtedly concluded that this model with multilevel technique has an average match, since most of the significant variables in model (2) did not significantly contribute to explain unexplained variance on dissimilarity in student achievement in mathematics across Turkey. Furthermore, relying coefficients created in the last model and if there was a holding constant of other variables, students who had high M-SC also achieve better in mathematics learning than those with low M-SC with score increased by 0.115. Moreover, the score of student mathematics learning achievement would increase by 0.073 for every added unit of SCM.

Table 3: The Result of Multi Level Modelling

Variable	Indonesia		Japan		Turkey	
	Model I : Student	**Model II : +School**	**Model I : Student**	**Model II :+School**	**Model I : Student**	**Model II : +School**
Student-Level Variable						
Math-Self Concept	0.071(0.02)*	0.066(0.017)*	0.131(0.022)*	0.104(0.09)*	0.118(0.016)*	0.115(0.014)*
Math-Attitude	-0.005(0.02)	-	-0.038(0.022)	-	0.008(0.018)	-
School-Level Variable						
School Climate		0.047(0.015)*		0.022(0.019)		0.073(0.012)*
Variance Explained						
Student	0.0038	0.0030	0.010	0.010	0.012	0.018
School	0.068	0.939	0.632	0.703	1.000	1.000
Total	0.004	0.006	0.01	0.01	0.012	0.018

* Significant level: *p-value* < 0,05

DISCUSION

The research indicated that 99.7% of total variance on achievement of student in learning mathematics in Indonesia was associated with within-school differences, while 0.3% was associated with among schools located in the similar country. In other word, 100% from student mathematics achievement total variance in Japan was related with the students' difference within-school and 0% of the total variance of students' mathematics learning achievement was connected with the differences among schools. This means that the education in 12 schools from the three countries were indicated more impartial. These findings are on the same side with previously conducted research, which suggests that school education systems in developing and developed countries more emphasis on policy with equality (Gustafsson, Nilsen, & Hansen, 2015). It means that there is no dismilarity in the teaching quality among schools, where all students are exposed to a high quality education system, no more special treatment that high quality education system is only for high achieving students.

The findings out of this study demonstrated that M-SC is a very significant predictor in influencing students' mathematics learning achievement for all involved countries in TIMSS. The findings reinforce the outcomes previously studied the that students M-SC (preschool students) is very influencial component on student mathematics learning achievement (Arens et al., 2016). The findings of research also show that M-ATT do not have significant influence students' mathematics learning achievement in the three countries. It indicates that some female students still vulnerable to the harmful effects of mathematics, that mathematics does not really pose the contribution to the future of a woman in general (Charles, Harr, Cech, & Hendley, 2014). It means that some students are not so affected by the harmful effects of mathematics, but their mathematics learning achievement is varied, some are low and some are still high. In conclusion the three countries, Indonesia, Japan, and Turkey still have students with a negative mind-set towards learning mathematics which have a negative effect on the low mathematics learning achievement, but there are also students whose learning achievement remains high.

By the other side, SCM is the significant in predicting student mathematics learning achievement in Indonesia and Turkey, but not for students in Japan. This is supporting previous findings which suggest that perceptions of SCM may affect learning environments and student learning achievements (Boulifa & Kaaouachi, 2015). More specifically, the findings of previous studies using sample students from Turkey show that students that frequently go to school with an optimistic climate have better performance than students who frequent school which badly rated by the school headteacher (Erberber, 2010). While in Japan, SCM is insignificant due to the high Human Development Index (HDI). This support the results out of previous studies in developed countries that the SCM effect on achievement of students tend to vary, this is an illustration of the function of the level of human development level (Gustafsson et al., 2015).

Based on the finding of multilevel analysis on the final model, M-SC is the dominating predictor of student mathematics learning achievement in three countries. Further review, however, the coefficient of M-SC in learning achievement is very small. This outcome is sided with recent research that students' self-concept is generally able to influence students' learning achievement in mathematics and reading ability even though in low level, where male students are higher in mathematics than female based on self-concept. The latter are higher at reading concept (Caputo, 2015). If it is related to the coefficient on M-SC detected from students' toward their achievement in learning mathematics across three countries, which is very small but remain significant. In all three countries, the dismilarity between male and female students on self-concept could be a factor that needs to be acted upon. Nevertheless, the coefficient of M-SC remains greater than the SCM coefficient.

Findings coming out of the analysis with Multilevel technique indicate that the last model is able explicate 0.6% of the overall unexplained variance in student mathematics learning achievement in Indonesia, 1% for students in Japan, and 1.8% for students in Turkey. More specifically, 0.3% and 93.9% of all variables in the final model succeeded in explaining the differences in mathematics achievement in Indonesian from within-school (125,789) and among schools (0.441). The same case in Japan, 1% and 70.3% of the significant variables in the final model succeeded in explaining the differences in students' achievement in within-school (165,489) and among schools (3.70E-21), while in Turkey, 1.8% and 100% of the variables within the model succeeded in explaining differences in achievement of student in mathematics in Turkey from within-school (156,466) and among schools (2.12E-08). Contrary, there are still variance that still unexplained in the final model (99.4%, 99%, and 98.2%) in Indonesia, Japan, and Turkey. The final model this research has not been very good, because it only can explain the unexplicated variance associated with the students' learning achievement difference in mathematics among the three countries, especially at the student level. It suggests that the further research take into consideration other explanatory variables that may explicate the remaining variance.

CONCLUSSION

This study resulted in a "unique" insight into the mathematics learning achievement of grade-4 of primary school students identified through the indicated factors contributing in explaining the student achievement dissimilarity in mathematics across Indonesian, Japanese and Turkish. Analysis with multilevel resulted in showing that students' achievement learning mathematics proved no difference for all three countries, by the school of level, (inter-school). However, the difference is purely derived from the student factor itself (in-school). In addition, the final multilevel model also provides information that M-SC and SCM is defined as a predictor of student's mathematics learning achievement, although it cannot be said to be a good model because it can only clarify the variance of student's achievement in learning mathematics for all three countries. It is important that students' positive M-SC should be embedded or established early (before elementary school) through a friendly SCM, as both have a contribution in predicting student mathematics level of learning achievement.

In general, the findings of this research comes up with the indicate that policymakers, educators and parents should consider student M-SC early (before entering primary school) and SCM in making educational policies and designing related curricula as well. This study highlights the factors that can predict students' achievement in mathematics learning in Indonesia, Japan, and Turkey by applying multilevel analyses that significantly contribute to knowledge procuration and fill gaps in existing research literature.

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