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What 's Wrong with the Asian and African Students' Mathematics Learning Achievement? The Multilevel PISA 2015 Data Analysis for Indonesia, Japan, and Algeria

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Abstract

This research aims at knowing the factors, both at students and school levels, related to the math learning achievement for students in Indonesia, Japan, and Algeria by using PISA 2015 data. The sample in this study consists of students from three countries that took part in PISA 2015. The three countries chosen are Indonesia, Japan, and Algeria, each respectively having as participants 5.800, 6.411, and 4.460. The findings showed that the sense of belonging of students towards mathematics, the socio-economic status of their families, and the average of schools' social-economic status can predict significantly the students' math learning achievement for the Indonesia and Japan, while for the Algerian students the socio-economic status is statistically insignificant in predicting their learning performance. The outcomes of this analysis support the idea that the school attended plays a big role as far as mathematics learning achievement is concerned. So, it should be summed up that the affective characteristics (sense of belonging of students), family background (students' socio-economic status), and the variable school-level (average socio-economic status of schools) can explain the big portion of variance among students as far as mathematics learning achievement is concerned.

Keywords: *PISA 2015, multilevel model, mathematics*

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INTRODUCTION

Programme for International Student Assessment (PISA) is a broad-scale assessment under the responsibility of the OECD every 36 months starting in 2000. PISA assesses the three major domains of knowledge and skills, namely reading, mathematics, and science literacy. For PISA 2015, the focus was put on solving problems through collaborative strategy. The judgement is not only to check whether students can receive knowledge, but also to investigate how well students can do an exploration of what they have learned and can apply it to new environments, both inside and outside the school. This information depicts the fact that the modern economy does not count what individuals know, but rather what they can do with what they know.

PISA also portrays information related to educational system that can help monitor the students' way of acquiring knowledge and skills in various countries, the economy, and different demographic subgroups in every country. More specifically, PISA provides evidence that can be trusted to diagnose the strengths and weaknesses of educational system (Prensel, Kobarg, Schops, & Ronnebeck, 2013). In other words, through PISA, different countries' educational systems are compared to one another.

In 2015, the report by PISA provides information that Eastern Asia countries have higher learning achievement than countries in Western Asia. Shanghai, Hongkong, Japan, and

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Korea are the countries of East Asia with the best achievement in math, science, and reading literacies (OECD, 2017a). Compared with some regions in Southeast Asia, the findings of PISA 2015 just showed varying achievements in math, science, and reading literacies. Singapore remained at the first rank in math, science, and reading, but Vietnam also showed, with its 8th position among 65 participating countries, high achievement in reading, mathematics, and science literacies. Indonesia was a country which participated in PISA 2015, so was Algeria. These countries were ranked as 57th and 64th respectively and are on the list of the ten countries that have low category scores in mathematics, reading, and science literacies. This shows the challenges that the two regions faced to promote their students' learning achievements in those literacies.

The results of the PISA 2015 also raise the question: "Can PISA 2015 data provide information on factors that may be related with students' learning achievement, especially in math literacy in Japan (East Asia), Indonesia (Southeast Asia), and Algeria (Africa)?" Related to this, the main concern in educational and psychological research is the affective characteristics because their impacts are incredible on the learning process and outcomes in schools (McCoach et, Gable, & Madura, 2013; Hattie, 2009). Many previous studies related the affective characteristics, such as students' Sense of Belonging at School (SOBAS) with the students' math learning achievements. SOBAS is very imperative to learning success (Chiu et al., 2016). SOBAS is the condition or students' feeling of "look[ing] at schools as important things in their long-term success, which is obvious through participating in learning activities" and "their relationship with the school staff and their peers" (Willms, 2003). SOBAS often indicate higher cognitive functions. Additionally, students with a high SOBAS often demonstrate a higher academic performance (learning achievement in mathematics), higher intrinsic motivation, and positive attitudes towards school.

Scientists have done research related to SOBAS due to two main reasons. First, the school does not only convey academic knowledge but also it improves the students' psychological growth and well-being during their schooling and this is influenced by both the feeling towards the school and sense of belonging. Second, the SOBAS can explain different other aspects of life outside school, such as the work success and life satisfaction. Regardless of the paramount of understanding the SOBAS, some researchers have previously conducted research about the SOBAS, and most studies up to this time are based in the North America, a cultural context that is relatively limited.

Besides the SOBAS, the students' parents' education index and employment also became a highly significant predictor of those students' achievement in learning math (Hampden-Thompson, 2013; Martins & Veiga, 2010; OECD, 2014c). PISA results show that students whose family background is high in ESCS perform better than other students. In General, there is a commonality of the world research literature about the positive correlation between the students' socioeconomic status and their achievement in learning mathematics (Hattie, 2009; Martin et al, 2012; Mullis et al, 2012). In addition, some studies examining the ESCS at the school level, measured as an average of the students' ESCS in every school (Anderson et al., 2007; Chiu & Klassen, 2010). The findings of the studies also indicated that the average of the schools' ESCS are predictors of achievement in learning mathematics, which is much more powerful than at the level of student based on their ESCS.

In particular, previous studies associated to the SOBAS, the students' ESCS index, the average schools' ESCS, and the students' learning achievement but those making use of PISA data with a multilevel analysis are still rarely carried mainly in Japan, Indonesia, and Algeria. Even though two of the three countries aforementioned, i.e., Japan and Indonesia, have participated from the beginning since the first PISA in 2000, Algeria joined recently in 2015. Individual countries' reports also focused more on the average score and percentage of the students' learning achievement based on certain demographic characteristics (e.g., Datafrom the Ministry of Education). It is important to highlight that ignorance or lack of will to use the multilevel analysis in dealing with PISA data can jeopardize important empirical evidences as there is decomposition of the students' learning achievements variance according to the school and students' levels and regardless the structure of the levels of the data (Raudenbush, Bryk & 2002).

Based on some research literature, it is indicated that some factors can predict the

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students' achievement in mathematics, e.g. SOBAS, index of the students' ESCS, and the average of the schools' ESCS. That is why even the aim of the present research is to find out how big is the unexplained variance in the students math learning achievement in terms of the differences within and among schools, the predictors of the students' math learning achievement, what is the most powerful predictor of the math learning achievement according to the late multilevel model, and how big is the mathematics achievement total variance described by the explanatory variables based on recent multilevel model in those three countries.

METHOD

Sample

In this study, the researchers determined the sample by selecting the students from three countries that participated in PISA 2015. The three selected countries as said earlier are Japan, Indonesia, and Algeria. They were opted for two reasons: the first is that these countries represent the diverse education systems across the world. The second is that these countries have average math scores. For Japan, the mathematical average score is above the average score set by the OECD, while the two other countries, namely Indonesia and Algeria, have an average math score below the OECD's average. The process of sampling can be discovered in the technical report PISA 2015 (see PISA, OECD website).

Variables

Dependent Variable

Mathematical literacy (Math score) in PISA 2015 involves four content areas: change and relation, shape and space, quantity, and uncertainty and data (OECD, 2017a) and is defined as: a person's ability to formulate, interpret, and use mathematics in different contexts. This includes reasoning in a mathematical way and use of concepts, procedures, facts and mathematical tools for describing, explaining, and predicting phenomena. It can also help individuals to recognize the worldwide mathematics role and to make a decision, which are requirements for any constructive, engaging, and reflective citizens, (OECD, 2017a).

Predictor at the Students Level

The predictors at the students' level are: the SOBAS and the students' parents' education and employment indices. The SOBAS in PISA 2015 consists of six items coded ST034. The students' parents' education and employment in PISA 2015 are coded ESCS. ESCS index ranges from-5 to 2 (OECD, 2017b).

Predictor at the School Level

Predictor at the level of schools is the schools average of ESCS. The average school in ESCS is calculated relying on students' ESCS from each school. The school average in ESCS is coded ESCSsch (OECD, 2017b).

Statistical Analysis

This research is the analysis of PISA 2015 secondary data for Japan, Indonesia, and Algeria. The sampling technique of PISA implies that students at the similar school will have many of the same characteristics as compared with students from other schools (Goldstein, 2011; OECD, 2014b). This is "the intra-class correlation (ICC)" that represents the proportion of the overall variance in the dependent variable that is connected to the cluster (Field, 2013). The ICC is considered a problem since many statistical models assume that the cases must be independent of each other, but this is not so for students who study in the similar school (Field, 2013). The multilevel modeling pays attention to grouping individuals, estimates the variation of the dependent variables associated with the differences within and between groups and finds out factors, at every level, linked to the dependent variables, by considering the standard error (SE) of the coefficients of regression (OECD, 2009; Steele, 2008; Woltman, Feldstain, & Mackay, 2012).

In this research, a two-level multilevel model was used. At level-1 (student level), the SOBAS and the students' ESCS indexes are used in the model to examine differences in schools, while at level 2, the researchers investigate the distinction (difference) among schools through the predictor at the school level (Schools' ESCS). Considering recommendations of the OECD (2009), this research uses the final score of the students to control the fact that some participants have larger proportions than the others, which can cause biased results (Kim, Anderson, & Keller, 2013). Before adapting the multilevel model, which is a priority of this part of the analysis, some descriptive statistics are used to inform about the participants. The software program used is R. 3.4.1 with R-Studio editor. 0.99.891.

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RESULT AND DISCUSSION

Descriptive Statistics

Before the main analysis, descriptive statistics are presented to provide the overview of the sample in a comprehensive manner. Table 1 illustrates the number of schools and students, and the average the of students' learning achievement scores based on PISA 2015 records for Japan, Indonesia, and Algeria.

Table 1. Average of Math Scores

Country	N School	N student	Average of Math Scores	SD
Japan	198	6411	534	81.092
Indonesia	218	5800	396	72.844
Algeria	155	4460	364	59.265

The average of the students' math scores for Japan (M = 534) outweighs the average score determined by OECD (M = 494). The students from Indonesia and Algeria have an average score in mathematics learning achievement (M = 396 and M = 364 respectively) is smaller than the average score set by OECD (M = 494) even though the average score in mathematics of Indonesian students is still higher than the Algerians'.

Multilevel Model

PISA samples are grouped (clustered) based on the school and if the grouping is taken into account, then the proportion estimate of the variation in the dependent variables is calculated through specific independent variables could be more valid (Woltman, Feldstain, & Mackay, 2012). Therefore, the two-level multilevel model was used with the intention to know how variables at students' and schools' levels contribute to the students' achievement in learning mathematics. The analysis starts with the simplest model (null model, Step 1) and systematically moves towards more complex levels (step 2-3) as suggested by Hox (2010). The mathematical equations of the multilevel model are shown in Equation (1).

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

Where Y is dependent variable, X_1, X_2, and X_3 are independent variables (predictors), i individual or student, j group or school, β_0 adalah mean of intercept, β_1, β_2, β_3 coefficient of each predictor (X), dan ε_{ij} error or residual at the individual or student level. $\beta_{0j} = \beta_0 + U_{0j}$, where U_{0j} is an error or residual at the group or school level.

Step 1: Null Model

Table 2 contains the results from the MLM analysis with a null model. Intra-class Correlation (ICC) is at the ratio between the sum of variance at the school level and that of the variance of the two (both the student's and school's levels). Table 2 also shows that about 54% of the overall variance in mathematics learning achievement result from schools differences in Japan, about 55% in Indonesia, and about 38% in Algeria. The findings show that the inter-school variation in mathematics achievement for those three countries is quite huge. The findings also confirm the wish for further analysis related to relationship between variables on both students and teachers, and the students' math learning achievement in each of three countries using a multilevel approach.

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

Indonesia

Equation (2) indicates that all of the explanatory variables at the student level found in the model is predicting learning achievement in mathematics, and it is statistically significant, since its estimation coefficient is more than the doubled value of its Standard Error (SE) (Gelman & Hill, 2007).

Table 2. The results of the analysis of the MLM for the Fixed and Random Effects of Null Model

Country	Effect	Variable	Par Est.	SE	SD	ICC
IDN	Fixed	Math Score	390.536	3.691	-	0.55
	Rand	Bet Sch Var	2857		53.45	
		With Sch Var	2297		47.93	
JPN	Fixed	Math Score	531.992	4.342	-	0.54
	Rand	Bet Sch Var	3636		60.3	
		With Sch Var	3084		55.53	
ALG	Fixed	Math Score	361.53	2.978	-	0.38
	Rand	Bet Sch Var	1281		35.8	
		With Sch Var	2119		46.04	

*IDN=Indonesia, JPN=Japan, ALG=Algeria

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Math = β0j+0,188(0.09) SOB+9,83(0,77) ESCS + eij (2)

Simply put, students with a higher sense of belonging (SOB) have a better performance compared to those with low sense of belonging in math. In addition, ESCS variables also showed that students are linked to positive students' mathematics achievement, for students with higher level of ESCS perform better in math tests than students with low socio-economic status (Low ESCS level).

After explanatory variables were added (the students' SOB and ESCS) into the multi-level model, the unjustifiable variance decreased from 2297 to 2252 and at the level of school from 2857 until 2293. This decrease shows that most mathematics learning achievement variance at the student and school levels is a result of sense of belonging and students' family background variables. Broadly speaking, this multilevel model explains 11.8% of the overall variance in mathematics learning achievement. Specifically, the explanatory variables involved in the model successfully explained the 20% of the total variance at the level of the school and 2% at that of students as well. From the two predictors in the model, the student's ESCS index proved itself the strongest predicting variable in Indonesia.

Japan

For Japan, the explanatory variables at the student level that are included in the model are predictors of achievement in mathematics learning which are also statistically significant, as shown in equation (3):

Math = β0j + 0.33 (0.09) SOB + 11,78 (1.11) ESCS + eij (3)

Similar to Indonesia, students in Japan who have a sense of belonging (SOB) also showed high math learning achievement better than those with low sense of belonging (SOB). It is similar to the students' ESCS index in Japan which was also revealed to be associated with positive student achievement in learning mathematics. Specifically, the students' math learning achievement on the Asian continent (East Asia and Southeast Asia) is affected by the students' family background (students ESCS index).

It is also reinforced by the presence of a decrease in variance that cannot be justified at the student level and at the school's in Japan as well after adding the explanatory variables (the students' SOB and ESCS indexes) into the multilevel model, i.e. at the level of both students and school, the decrease is respectively from 3084 to 2993 and 3636 to 3197. This decrease shows that most of the variance at the student and school level in math learning achievement is caused by the SOBAS and the variables linked to the family background. In a nutshell, this multilevel model describes 7.9% of the total variance in mathematics learning achievement. Specifically, the explanatory variables used in the model successfully explained the 12% of the overall variance at the school level and 3% at the student's. From the two predictors included in the model, the students' ESCS index appears to be the strongest predictor of the students' achievement in learning mathematics in Japan.

Algeria

For Algeria as shown in equation (3), not all of the explanatory variables at the level of students within the model (1) as predictors of achievement in learning mathematics are proven significant after statistical test. The students' ESCS variable is the explanatory variable at the students' level students which is not statistically significant, because the standard error value is greater than that of its estimation coefficient (SE) (Gelman & Hill, 2007; Steele, 2008b).

Math = β0j + 0,29 (0.06) SOB + 0.15 (0.76) ESCS + eij (4)

More specifically, in Algeria students who have a high sense of belonging (SOB) have better math learning achievement than those with a sense of belonging (SOB) that is remarquably low. The students' ESCS variable in Algeria was found to have a negative relationship with the students' achievement in mathematics, statistically the correlation between the two is insignificant. This means that the student's family background in Algeria is not a (strong) predictor of the students' math learning achievement.

Similarly, after the addition of the explanatory variables into the multilevel model, the unexplained variance at the level of student and school declined respectively from 3084 to 2993 and 3636 to 3197. This decrease shows that most of the variance at the student and school levels in mathematics learning achievement is due to the SOBAS and background variables. To sum up, this multilevel model describes 7.9% of the overall variance in math learning achievement. Specifically, the existing explanatory variables in the model successfully

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explained the 12% and 3% of the overall variance at the level of school and student respectively. From the two predictors included in the model, the ESCS index appears to be the strongest predictor of the students' achievement in learning mathematics in Algeria.

Step 3: Adding the Predictor Variable Level School (Final Model)

Indonesian

After analysing the explanatory variables in the model (1), and still found the large number of unexplained variance, the following step is to determine whether the schools' ESCS in Indonesia can explain such a difference. Equation (4) indicates that such a variable is the strongest explanatory variable in the model, because it has the largest estimation coefficient (b = 42.170) which is approximately fourteen times the standard error (SE = 3.127). Simply put, the value of the positive coefficient indicates that students who study in schools with a higher level of ESCS have higher mathematics learning achievement. As expected, the addition of such a predictor decreases the variance that cannot be explained at the level of school from 2293 to 1236, which reveal that nearly 37% of the difference in mathematics achievement among the schools attended by the students is described by the average of those schools' ESCS. After adding the predictor of the schools' ESCS to the random intercept models, the students SOB and ESCS indexes apparently remain significant. This indicates that the student's mathematical achievement is explained by the variables included in the model.

Math = β0j + 0.18 (0.09) SOB 8,39 (0.78) + stdESCS + 42,17 (3.21) schESCS + eij (5)

Japan

For Japan, the equation (6) indicates that the school ESCS variable is the strongest explanatory variable in the model, because it has the largest coefficient estimation (b = 128.99) which is approximately nineteen times the standard error (SE = 7.49). Simply put, the value of the positive coefficient indicates that the students studying at schools with a higher level of ESCS in Japan have high mathematics learning achievement. As expected, adding the predictor decreases the variance that cannot be explained at the level of school from 3197 to 1218, showing that nearly 54% of the difference in math achievement among schools attended by the students is explained by the average of those schools' ESCS. After adding this the predictor school's ESCS to random intercept models, the students' SOB and ESCS indices apparently remain significant. This shows that the students' math learning achievement in Japan is explained by the variables used in the model.

Math = β0j + 0.34 (0.09) SOB + 10,61 (1.12) stdESCS + 128,99 (7.49) schESCS + eij (6)

Algeria

For Algeria, equation (7) indicates that the school ESCS is the strongest explanatory variable in the model, because it has the largest estimation coefficient (b = 39.34) which is approximately nineteen times the standard error (SE = 5.72). Practically, the positive coefficient values indicate that students in schools with a higher level of ESCS in Algeria also have high mathematics achievement. As expected, adding the predictor decreases the variance that cannot be explained at the school level from 1258 to 938, which shows that almost 25% of the difference in math achievement among schools attended by the students is justified by the average of the schools' ESCS. After adding the predictor school's ESCS to random intercept models, the students' SOB apparently remains significant. This shows that students math learning achievement is explained by the variables included in the model.

Math = β0j + 0,29 (0.06) SOB + 39,34 (5,72) schESCS + eij (7)

Last Model Interpretation

Indonesia

Taking into account the variables of family background, sense of belonging and the variables that are linked to the school, the multilevel last stage model explains almost half (32.3%) of total variance that cannot be justified in the math learning achievement, for the total variance decreases from 5154 and became 3487. More specifically, this model explains respect-tively 2% and 56.7% of the difference at the student and school levels. In general, the conclusion can be taken that the multilevel model has a level of appropriateness that is ranked as good, because there is statistical significance for most of explanatory variables and those variables have explained most of the variance that cannot be explained. Table 3 contains the summary multilevel model parameter estimation of the two-stage analysis.

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Having a look at the model coefficients form at the last stage of the model, with making the other variables constant, the students with a sense of belonging highly achieve in math than students whose sense of belonging is low, that is, low with the increase in score of 0.18. Next, the students' math learning achievement scores will be increased by 8.39 and 42.17 for every additional unit of students' ESCS average and schools ESCS.

Japan

For Japan, the last multilevel model stage explains almost half (37.3%) of the unexplained overall variance in mathematical achievement, for the overall variance decreased from 6720 to become 4211. More specifically, the model describes the rate of 3% and 66.5% difference respectively at both school and student levels. In a nutshell, the researchers concluded that the multilevel model has level of appropriateness that is ranked as good, as long as there is statistical significance for most of the variables explained most of the variation to which explanation could not be found. Table 3 summarizes the model parameter estimation of the two-stage analysis.

According to the model coefficients form at the end, with the other variables constant, the students with a high sense of belonging equally have, with the increase score of 0.34, a high achievement in mathematics learning than students with a low sense of belonging. Furthermore, the students' learning achievement in mathematics will increase by 10.61 and 128.99 for every additional unit of the average of the students' and schools' ESCS.

Algeria

For Algeria, the multilevel model only explained 10.4% of the overall variance that could not be justified in mathematics learning achievement, for the total variance decreased from 3400 to become 3047. More specifically, the model describes respectively the rate of 0.5% and 26.8% of difference at both school and student levels. To sum up, the researchers can conclude that the multilevel model has a good level of appropriateness, because there is statistical significance for most of explanatory variables and such variables explained most of the variance that could not be explained. Table 3 gives the summary of the model parameter estimation of the two-stage analysis.

According to the coefficients of the model form at the end, with making the other variables constant, the students having a high sense of belonging correlate, with an additional score of 0.29, with high achievement in mathematics learning than students who have low a sense of belonging. Next, the students' math learning achievement score will be increased by 39.4 for every additional unit of the average of the school's ESCS.

About the first research question, "how big is the unexplained variance by relying on the students' achievement in math learning in terms of the differences within and between the respective schools?", this research shows that 55.43% of the overall variation in students' achievement in math learning in Indonesia is associated with differences between students, while 44.57% out of the total variation is linked to differences at school level in Indonesia. On the other hand, there were 54.11% of the overall variation in the students' mathematics learning achievement in Japan linked to the differences among students and 45.89% of the overall variation linked to differences at the school level in Japan. As well as in Algeria, 37.68% of the total variation in the students' math learning achievement is connected to differences among students and 62.32% of the overall variance is linked to how schools are different. These findings fit with previous studies indicating that the predictor variables at the level of school explain the majority of the students' school performance (Martins & Veiga, 2010).

The difference among the schools became the major factors contributing enormously in explaining the students' math learning achievements in the three countries, namely Indonesia, Japan, and Algeria. Based on the results of the secondary data analysis of PISA Australia in 2003, it was found that the grouping of schools based on the level of the ESCS of each school will benefit the students in high category of family background (ESCS) and it would be very detrimental to the students from low category of family background (ESCS) (Perry & McConney, 2010). That is because the curriculum and educational programs of high quality are concentrated on public and private schools with higher levels of ESCS (Lamb, Hogan, & Johnson, 2001). Students with the high ESCS tend to make a choice of attending a school that has a rigorous academic program.

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Table 3. MLM Analysis Results

Variabel	Indonesian		Japan		Algeria	
	Model I: Student	**Model II: +School**	**Model I: Student**	**Model II: +School**	**Model I: Student**	**Model II: +School**
Student-Level:						
Sense of Belonging (SOB)	0.188(0.09)*	0.183(0.09)*	0.333(0.09)*	0.342(0.09)*	0.294(0.06)*	0.295(0.06)*
ESCS Index	9.83(0.77)*	8.393(0.78)*	11.787(1.11)*	10.61(1.123)*	0.154(0.76)	-
School-Level:						
School ESCS Mean		42.17(3.217)*		128.99(7.491)*		39.34(5.72)*
Variance Explained						
Student	0.02	0.02	0.03	0.03	0.004	0.005
School	0.197	0.567	0.121	0.665	0.018	0.268
Total	0.118	0.323	0.079	0.373	0.009	0.104

On the other hand, there is SOBAS factor that also has a role in explaining the differences between schools in the students' math learning achievement in Indonesia, Japan, and Algeria. Findings in Chiu et al. (2016) that the family background (student's ESCS), the teacher, and schoolmates have a positive relationship with the SOBAS, and students who have outstanding academic achievement also have high SOBAS. That is, students who come from families with high incomes and the availability of books at home have higher SOBAS. In the same perspective, the students who attended schools with high average of ESCS have high SOBAS, as teachers and schoolmates in these schools provide larger support and there is a more disciplined classroom climate. Thus, there is a tendency that schools with high ESCS are attended by students with high ESCS, which creates higher SOBAS among such students. Automatically, the students with high SOBAS will perform higher in terms of learning achievement.

The multilevel model end stage also managed to answer the second and third research questions, that is, "what are the factors that can predict statistically the students' mathematics learning achievement?" and "what is the most powerful predictor of math learning at the multilevel model final stage? ". The results showed that the SOBAS and the students' and schools' ESCS can predict in a statistically significant way the students' math learning achievement in the PISA tests for Indonesia and Japan. However, in Algeria only SOBAS and school ESCS are statistically significant in the PISA test. The students' ESCS index is thus not statistically significant, meaning that the educational background and the employment of the students' parents do not affect the Algerian students' math learning achievement in the PISA test. These findings fit with a lot of other studies that have highlighted the importance of family background and affective aspect variables in the students' math learning achievement (Byrnes & Miller, 2007; Chiu & Klassen, 2010; Hampden-Thompson, 2013; Stankov, 2013).

More specifically, this research concluded that the students' family background is not a statistically significant predictor of the students' mathematics learning achievement that can be generalized to all countries. That is, the students from high or low category family background (students' ESCS) who attend schools that have a high ESCS both have high math learning achievement, while the students from high or low category family background (students' ESCS) who attend a school with ESCS have low math learning achievement. The findings of this study also revealed that the school ESCS variable may explain the low students' mathematics learning achievement. So, all over the world, the students' mathematics learning achievement is not influenced by the family background, but the background of the school and the students ' affective factors really influence the students' math learning achievement in most countries.

In addition, the multilevel analysis results corroborate previous research results, which showed that the average students' and schools' ESCS are a significant predictor of students' math learning achievement (Anderson et al., 2007; Chiu & Klassen, 2010; Mullis et. Al., 2012). In addition, ESCS measured at the level

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of the school was found to be the strongest predictor of the students' math learning achievement and a much more powerful predictor than SOBAS and the ESCS, which is also supported by nowadays research literatures. These findings indicate that the education system in Indonesia and Japan are characterized by social injustice, because students from different backgrounds do not have the same possibilities to succeed in school. More specifically, the schools in Indonesia, Japan, and Algeria seem to reinforce the characteristics of the social injustice, rather than solve it, because the students who attend schools with low socioeconomic average (ESCs) do not have better mathematics achievement than students who study in schools with high socioeconomic level (ESCs).

Lastly, the fourth research question to answer is "How big is the total variance in mathematics learning achievement to be explained by the explanatory variables in the multilevel model final stage? ". The multilevel analysis results showed that the model end stage was able to explain 32.3% of the total variance that could not be explained in the students' mathematical learning achievement in Indonesia, amounting to 37.3% in Japan, and 10.4% in Algeria. Specifically, the 2% and 56.7% of the differences in students' mathematical learning achievement in Indonesia comes respectively from within and between schools, each of which is explained by the explanatory variables included in multilevel model end stage. In Japan as well, 3% and 66.5% students' math learning achievement differences derive respectively from within and between schools, while in Algeria, only 0.5% and 26.8% of the differences in the students' mathematical learning achievement in Algeria originate respectively from within and between schools. However, there is much more amount of variance that is not yet statistically proved significant (67.7%, 62.7%, and 89.6% respectively) in Indonesia, Japan, and Algeria. This indicates that the next research should consider testing the other explanatory variables that can explain the remaining unexplained variance.

CONCLUSION

This research has produced unique insights about the students' math learning achievement by identifying the factors that predict in a statistically significant way the students' math learning achievement in Indonesia, Japan, and Algeria. The multilevel analysis results show that the school attended by students highly explains the variation in their math learning achievement. In addition, the final stage of the model proves the predictive strength of the students' family background (students' ESCS) characteristics and the schools ESCS in statistically predicting the students' success in mathematics. The analysis also shows the importance of the students' sense of belonging on mathematics as it was found statistically significant and related to mathematics learning achievement. Because the average school ESCS that is associated positively with achievement in math learning is the strongest predictor of the outcome variable, then the school itself can contribute to mathematics learning achievement.

Broadly speaking, the findings indicate that policymakers, educators, and parents should consider the sense of belonging, the students' and schools' ESCS in designing the policies and curricula needed in educational system. This study highlights the factors that can predict the students' math learning achievement in Indonesia, Japan, and Algeria by applying the multilevel analysis that significantly contributes to the establishment of knowledge and fill the gaps in the existing research literature.

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