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Student and School Factor's Influencing the Mathematics Achievement: An HLM Analysis of Indonesian Data in TIMSS 2015

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Abstract

Indonesia continues to participate in Trends in International Mathematics and Science Studies (TIMSS) to increase understanding of academic performance in mathematics and science. This study aims to examine the determinants of the mathematics achievement of fourth-grade students in Indonesia from student-level variables and school-level variables. Two-level hierarchical linear modeling was used to analyze data of 4025 students from 230 schools in Indonesia who had participated in the TIMSS 2015 study. The result indicated schools resource shortage has a negative direct effect on mathematics performance, while literacy and numeracy skill when the student enters the school has a positive direct effect. In student level, home resources, parents' education, self-efficacy and students' interest in mathematics have a positive direct effect. The model also revealed a cross-level interaction between school level and student level. It is the economic background of student in one school that had a moderating effect on home resource toward mathematics performance. Variance explained from students and school levels were 17% and 44%, whereas total variance explained were 28%. The results were sizeable to make some recommendation for policy consideration which social economic background and affective characteristics of students are the main determinants of mathematics performance among Indonesian Students.

Keywords: mathematics achievement, self-efficacy, students' interest in mathematics, TIMSS study

Abstrak

Indonesia terus berpartisipasi dalam survey Trends in International Mathematics Science Research (TIMSS) *untuk lebih memahami kinerja akademik matematika dan sains siswa-siswa di dunia dan di setiap negara yang berpartisipasi. Penelitian ini bertujuan untuk mengetahui faktor-faktor yang mempengaruhi prestasi matematika siswa Indonesia ditinjau dari variabel pada tingkat siswa dan tingkat sekolah. Penelitian ini menggunakan pemodelan linier hierarkis dua tingkat* (two-level Hierarchical Linear Modeling) *untuk menganalisis data dari 4025 siswa di 230 sekolah di Indonesia yang berpartisipasi dalam survei* TIMSS *2015. Hasil penelitian menunjukkan bahwa faktor pada level sekolah yang mempengaruhi prestasi matematika secara langsung adalah keterbatasan sumber daya sekolah dan tingkat keterampilan literasi dan komputasi saat siswa masuk sekolah. Sedangkan faktor yang berpengaruh di tingkat siswa adalah sumber daya di rumah, pendidikan orang tua, efikasi diri, dan minat siswa terhadap matematika, semuanya memiliki dampak positif langsung. Pengujian ini juga menunjukkan adanya interaksi lintas tingkat yaitu latar belakang ekonomi para siswa di suatu sekolah memiliki dampak moderat pada sumber daya di rumah yang terkait dengan nilai matematika. Varians yang dijelaskan pada tingkat siswa dan tingkat sekolah masing-masing adalah 17% dan 44%, sedangkan jumlah total varians yang dijelaskan adalah 28%. Hasil peneltian ini menunjukkan bahwa latar belakang sosial ekonomi dan karakteristik emosional siswa merupakan penentu terpenting pencapaian matematika di kalangan siswa Indonesia.*

Kata kunci: *efikasi diri, minat siswa terhadap matematika, prestasi matematika, survei* TIMSS

Introduction

Mathematics becomes one of the lessons in schools that are considered important because of its influence on technological progress which in turn has an impact on the progress of a country (Suleiman & Hammed, 2019). According to Chand et al. (2021), mathematics is a subject that affects all aspects of human life at various levels. The study by Sa'ad et al. (2014) argues that both education and human life do not work effectively without mathematical knowledge. In formal education, mathematics includes many natural sciences such as physics, chemistry, biology, engineering, and IT, as well as non-scientific fields such as accounting, economics, geography, and physics education, music, and art. Mathematics is one of the most important subjects in the school curriculum and serves as a bridge of all knowledge (Krajcik, 2011). The study by Tshabalala & Ncube (2013) emphasized that mathematics is the foundation and tool of scientific, technological and economic progress in all countries. It is a common belief among educators that no field of progress can be made without a basic knowledge of mathematics (Visser et al., 2015). According to Karakolidis et al. (2016), mathematics is the foundation of science and technology, without which a country can prosper and achieve economic independence. As such, mathematics is one of the main core subjects of the school curriculum from primary level.

In Indonesia, it is often heard the achievements of Indonesian students who won the international mathematics olympiad. But unfortunately when viewed nationally, the results of an international survey show Indonesian children's mathematical achievements included in the lower group from year to year. The achievement of Indonesian students in Mathematics and Science is still very low when compared to most countries participating in the TIMSS survey. Indonesia's position in both Mathematics and Science subjects is still at the bottom of the group if it is measured from the international average. **Table 1.** shows Indonesian students' rank in TIMSS study since 1999. Indonesia only follows for one population, i.e. second grade of junior high school (in the year 1999-2011) and fourth grade of an elementary school in 2015.

Table 1. Indonesian Students' Rank in Mathematics and Science

Year	Number of Participating Countries	Math	Science
1999	38	34	32
2003	46	35	37
2007	49	36	35
2011	42	38	40
2015	50	45	45

Source: https://timss2019.org/reports/

Trends in International Mathematics and Scientific Research (TIMSS) is an international comparative study that measures student competence in mathematics and science. TIMSS aims to see how each country's declared curriculum is implemented and student performance is improving, especially in mathematics and science. TIMSS is held every four years and is coordinated by the IEA (International Association for the Evaluation of Educational Achievement). Indonesia has been a long-standing member of the IEA and has participated in TIMSS study since its inception. Indonesia began to be listed in the publication of TIMSS results in 1999. Participation in the TIMSS study requires substantial cost because in addition to the cost of conducting complex surveys, participants must bear the attendance of international meetings at least twice a year, and must pay an expensive annual fee. However, Indonesia have to follow this study since the result give information that beneficial for taking policy.

International research has several advantages. International surveys can help policy makers such as governments, school leaders, and teachers make better decisions based on clearer data. Second, the publication of results provided global analysis and discussion to incorporate good practices. Third, international research data is often used as a starting point for domestic research and professional development programs (Cambridge International Examinations, 2015). Therefore, if participation in an international comparative study can function as above, certain policies can be adapted and developed, and even formulated an educational reform in order to achieve higher quality. Many developed countries that participated in this study made the result a consideration in the changes in their educational system. Many publication research, books, and dissertation are from US, Canada, Australia, Hong Kong, Canada, Netherlands, Scandinavia, Germany, Czech Republic, Hong Kong, Japan, and Australia. Otherwise in Indonesia, the amount of research analyzing TIMSS data is still very limited, and in general is still in the form of a descriptive report. Moreover, most studies in Indonesia focusing on student-level factors (such self-efficacy and student's interest on math) influencing mathematic performance without considering its school-factor level.

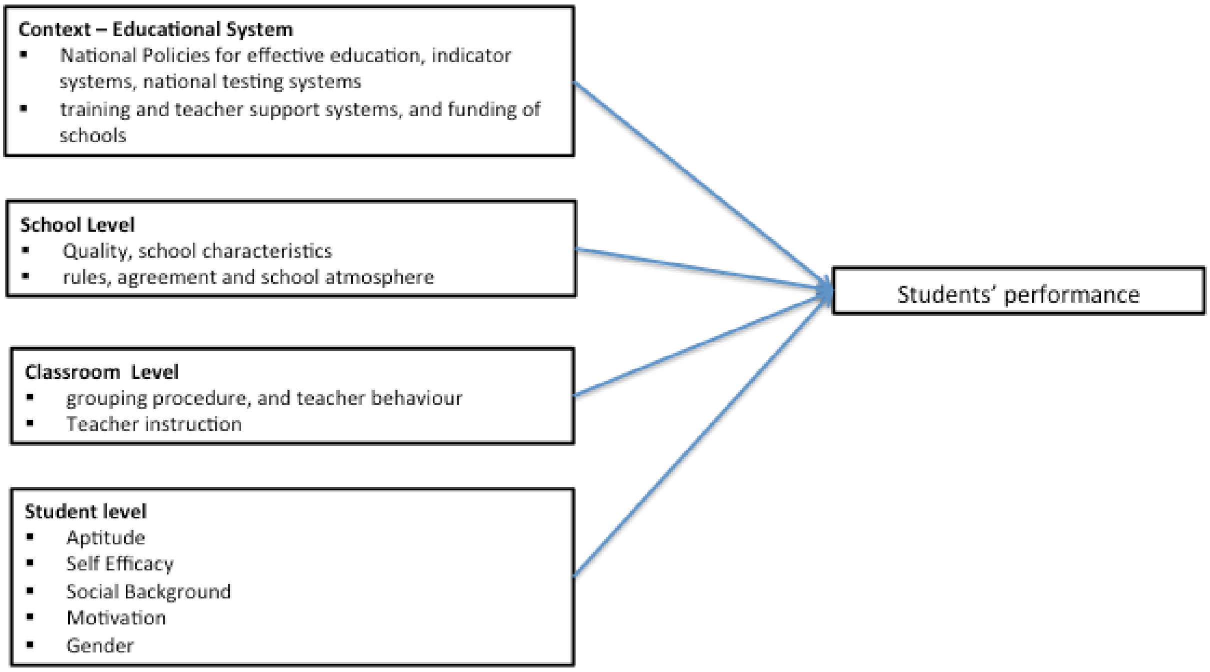
From the educational point of view, each student should be grown-develop in accordance with their potential and interests, but from the nation interests and point of view, the problem can be very different. Currently in global community, mathematics plays a crucial role for student's academic and professional development. Many countries around the world (such as Australia, Singapore, USA, Brunei Darussalam, etc.) determine mathematics as a compulsory skill that students should have. Mathematics is a priority in all countries because it involves the mastery of technology and industry. Therefore to survive in global competition, Indonesia needs to enhance their students' performance in mathematics. Unfortunately, Indonesia ranked in the bottom group of participating countries in TIMSS. Therefore, population data-based studies should be considered to help understand the factors that influence students' math performance.

This study aims to provides evidence-based insight about factors that affected mathematics performance. It is expected to contribute to a better understanding of how the variables associated with students, teachers, schools, and the environment may have an impact on learning achievements especially in Mathematics, both of which are impact directly or indirectly. This study aims to examine the factors that influence the mathematics achievement of Indonesian students in order to obtain a better understanding by using the 2015 TIMSS data.

Conceptual Framework

The Creemers (1994) comprehensive model of educational effectiveness has often been used in research. The model provided a list of factors that could affect student performance at four levels: student, classroom, school, and situation. Individual factors such as aptitude, background, and motivation determine student performance at the student level. Curriculum, grouping procedure, and teacher behavior are an example of factors in classroom level. Whereas at school level, there are rules, agreement, and atmosphere those influence classroom condition. Creamers also said that the level of school is influenced by the level of context. Conditions for developing and improving quality at the context level include national policies for effective education, indicator or national policies for evaluation, national examination systems, training and teacher support systems, and school funding. **Figure 1** shows the basic conceptual framework for educational effectiveness of Creemers (1994).

The TIMSS study also provided the basis for background information covering five broad areas, such as country and community conditions, family conditions, school conditions, classroom conditions, student characteristics and attitudes towards learning. Therefore multilevel relationship among contexts should be taken into consideration. This assumption is also relevant to multilevel organization theory (MOT). For major research questions, it is important to identify factors that influence math performance, especially student and school level factors that can be manipulated by politicymakers. MOT explains that the interaction process can occur simultaneously at the lower level (student level) and higher level (school level) (Thien et al, 2015).



Source: Creemers (1994).

Figure.1 Basic Conceptual Framework: Model of Educational Effectiveness

In this study, the higher-level unit is referred to school factors that include the variable that exists in school context. The student-level variables refer to individual characteristics that belong to students. School characteristics are believed to be related to students' math grades. The first thing to consider when building a model of mathematical performance is the support variables of the student background and home environment. In addition, variables that represent "learning opportunities", such as school time spent studying the subject, are also very important (Scheerens & Creemers, 1989). Motivation is another important factor in explaining student outcomes. Motivational variables are defined as students' attitudes towards mathematics, their value in mathematics, and their perception of their ability to learn mathematics (Mullis, et. al 2012; Wigfield & Eccles, 1992, 2000). These personal characteristics need to be part of a conceptual model for learning at school.

From the economic definition of the effectiveness of education, effectiveness refers to the school's production process, which is the conversion of inputs into outputs. In the proposed integrated model, school grades can be seen as measured outcomes against a student's math grades. Inputs include school resources, student characteristics, and lessons. In addition, the model integrates three disciplines: educational psychology, sociology, and economics (Ker, 2016). From an educational psychology perspective, the focus lies on factors such as student motivation, classroom learning process parameters, and teacher preparation. The field of socioeconomics focuses on student gender, socio-economic status, background, parental education, school experience, and school / class climate. Educational economists emphasize the availability of school / educational resources and materials. As many studies such as Creemers & Kyriakides (2006), Bloom & Owens (2011), Rumberger & Palardy (2004), Kraft & Dougherty (2013), Lee, Smith, & Croninger (1997) and Strand (2010) studies, suggest these parameters can have a significant impact on student performance.

Research Problem

Achievement of mathematics is a function of many interrelated variables such as student ability, attitude and cognition, socio-economic variables, parent- and peer influences, and school-related variables (Hammouri, 2004). The purpose of this study is to use TIMSS-2015 data to examine student grade variables at student level and school level. Three research questions were asked in line with the purpose of this study.

A. What student-level and school-level variables are associated with Indonesian 4th grade math grades?
B. What is the percentage of variance explained at the Indonesian student and school level?
C. Is there any cross-level interaction between school-level and student-level factors related to Indonesian 4th grade math grades?

Methods

Participants

Participant data used is open data. data can be accessed by anyone through the official TIMMS website (https://timssandpirls.bc.edu). The participants of this research are the Indonesian elementary school who joined in TIMSS 2015 and their student. Indonesian students who participated in the TIMSS were grade four. The number of teachers who participated came from 230 schools in Indonesia with a total of 4024 students. The data selected for this study were only those from students who gave complete answers. Students who do not complete the information are not included in the study. The number of students with complete information is 2055 (49.99% of the students were girl and 50.00 % of the students were boy). The level of education of parents consists of father and mother. Most of the participants' fathers were low educated. Only 12.4% are undergraduate or higher, moreover the education level of the mother, only 9.1%. From School-level data, the proportion of schools from economically disadvantaged families, is becoming a factor influencing math performance. Of the 230 schools, 130 have more than 50% poor students.

Measures

A selection of relevant TIMSS 2015 variables was made in order to answer the research problem. The dependent variable of the study is mathematics achievement which has calculated by averaging plausible value (PV). The Creemer model used in this study are student-level and school-level. Student-level consist of Social-economic students background parents education, home resources), Students motivation (like mathematics, self-confidence on mathematics), and Gender. While the school level used consists of rules (Literacy and Numeracy Skills when students enter the school), and social economic schools background (Economy disadvantages). The following as shown in **Table 2.** is an explanation or definition of each variable in this study.

Table 2. Description of Variables

Variable Name	Variable Description
Like mathematics	Students' feeling or interest towards mathematics subject. Nine items were used to make the composite variable.
Self-efficacy	Students' perception of their ability in mathematics subject. Nine items were used to make the composite variable.
Home resources	Home resources for learning such as book, computer, and tablet (2-point scale: 1=yes, 0=no). Composite score obtained from summing responses for three variables.
Parents education	Education level of father and mother.
Gender	Students' sex, girls and boys (2-point scale: 1=girl, 2=boy)
Economy disadvantage	Percentage of school students from economically disadvantaged families. The higher the score, the more disadvantages.
Student skill entered	Students' ability in literacy and numeracy when the student enters the school.
Resource shortage	Schools' ability to teach mathematics is affected by lack or inadequacy of resources and technology. The higher the score, the more deprived the school.

Data Analysis

The analysis is designed to get answers to research questions. The first step taken is descriptive statistical analysis. Then, the data explorations aiming at factors that influence achievement in mathematics consist of scale. Confirmatory factor analysis (CFA) and reliability analysis have been carried out on sets of items referring to one factor. Sets of items with a reliability coefficient Cronbach α of at least 0.7 involved in the analyses have been selected as a composite variable indicating factor from Creemers' model. Cronbach's alpha for liking mathematics scale was 0.80, for self-confident in mathematics 0.77, and for the engagement to mathematics lesson scale 0.76. The CFA testing indicated that all variable measuring independent construct.

Hierarchical Linear Modelling 6 (HLM 6) (Raudenbush et al., 2004) software was used for data analyses. Traditional modeling techniques, such as regular regression, ignore the importance of group effects and dependencies and are not suitable for analyzing data at multiple levels (Ker, 2015). Hierarchical Linear Models (HLM) are commonly used to analyze hierarchical data structures that have lower-level entities nested within higher-level entities. This study uses HLM to investigate the causes and effects of these factors on mathematical performance.

A total of 2055 students were included in the analyses. Missing value analysis was run in SPSS and listwise deletion option in the HLM analysis was selected to address the missing data issue. All predictor variables were centered around their grand means except for gender. In the HLM analysis, overall plausible values (PV) were used as outcome and weighting variables at both the student and school levels. The HLM 6 Statistical Software Package (Scientific Software International, Inc.) allows users to perform complex PV calculations and specify weights in multilevel analysis.

A null model has been launched to create a multilevel model. The null model contains dependent variables, 4th year math performance, and no dependent variables other than intercept. The null model serves as a base model for comparison with the results of the final model. The final model is developed by adding the executed student and school level variables to the null model. The final model included student-level and school-level variables that showed a statistically significant relationship to math grades.

Models

The null model

To obtain evidence about variation in student mathematic performance, HLM runs a random effect ANOVA model. This analysis provides the point estimate of the grand mean mathematic achievement and the confidence interval for the grand mean mathematic achievement. It also provides the estimate of the intra-class correlation (the proportion of variance in mathematics performance among schools) as justification for the further HLM analysis.

Student level (level-1) model

$$Y_{ij} = B_{0j} + R_{ij}$$

where Y_{ij} is the mathematic performance of student *i* in school *j*, B_{oj}. is the mean mathematic performance for the j^{th} school, and r_{ij} is the deviation of performance of student *i* in school *j* from mean mathematic performance.

School level (level-2) model

$$B_{oj} = G_{00} + U_{0j}$$

where, G_{00} is the grand-mean mathematic performance for the population of schools and U_{0j} is the deviation of mean mathematic performance of school *j* from grand-mean mathematic performance.

Random-Coefficients Model

Each of the student-level variables (i.e.,) were entered separately in the unconditional model, followed by those variables significantly related to math achievement retained to make the level-1 model.

Yij=b0j + b1j LikeMath ij +b2j SelfEfficay ij +b3j HomeResources ij +b4j Gender ij +*r*ij
bpj = gp0 + upj (where p= 0,1,2,3)

In the equations, Yij, b0j, g00, u0j, and *r*ij were defined as in the unconditional model noted above. b1j to b3j referred to regression slopes of school j. gp0 referred to the level-2 fixed effects, and upj referred to the level-2 random effects.

Similarly, at level-2, each of the school-level variables was separately entered in Model 2, and finally, all level-2 statistically significant variables were retained to make the full model.

Yij=b0j + b1j LikeMathij +b2j SelfEfficacyij +b3j HomeResourcesij +b4j Genderij + *r*ij
bpj = gp0 + gp1 ParentsEdu + gp2 EcoDisadvantage + gp3 StudentSkill + gp4 ResourceShortage + upj
(where p= 0,1,2,3)

In the equations, Yij, b0j, g00, u0j, and *r*ij were defined as in the unconditional model noted above. b1j to b3j and upj were defined in the level-1 model. gp0 to gp3 referred to the level-2 fixed effects, and upj referred to the level-2 random effects. With statistical results obtained from the full model, Model 3, inferences were made about the extent of all statistically significant level-1 and level-2 variables related to TIMSS 2015 4th grade math achievement.

Result and Discussion

Results

Descriptive Statistics

Table 3. shows a description of the data analyzed. The score of mathematics achievement is mostly between 343 to 495. With the same number of items, like Mathematics scores are higher when compared to Self Efficacy. Most of the Like mathematics scores are between 29.93 to 36.13 while Self-efficacy is between 22.51 and 32.83.

Tabel 3. Descriptive Statistics

Variable	Minimum	Maximum	Mean	Standard Deviation
Math Achievement	214.11	624.97	419.58	75.87
Like Mathematics	23	36	33.03	3.103
Self Efficacy	14	36	27.67	5.159

Hypothesis Testing

Table 4 shows the results of the HLM analysis with the null model. The estimate of the within-group variability (the variance of student performance around the school mean) and the estimate of the between-group variability (the variance of school mean performance around the grand mean) are 4340.9 and 29.67.09, respectively. The estimated value of between-group variability is found to be statistically significantly ($p < .001$) indicating that significant variation exists among schools in their mathematics performance. The intraclass correlation (ICC), which represents the proportion of variance in mathematic performance among schools, is found to be 41%. This indicates that about 41% of variation in mathematic performance lies among schools. The results confirmed that the relationships between student-level variables on mathematics performance and school-level variables on mathematics performance using a multilevel approach should be investigated.

Table 4. HLM Results of The Fixed and Random Effects of The Null Models

Fix Effect	**Coefficient**	**SE**		**p-value**
Grand Mean Math Performance, G00	406.15	5.00		.00
Random Effect	**Variance**	**Chi-square**	**df**	p-value
School (level 2) effect, U0	2967.09	1615.06	152	.00
Student (level 1) effect, R	4340.93			

Based on the null model, student-level variables were included in the null model. Non-significant student-level variables with the highest p-values were initially eliminated using the backward exclusion approach. The analysis was repeated until all non-significant student-level variables were excluded from the analysis. Then, repeated the same procedure for school-level variables.

Figure 2. shows HLM results of the fixed and random effects of the final models. As seen on that figure, schools resource shortage have a negative direct effect to mathematics performance, and literacy and numeracy skill when student enter the school have a positive direct effect to mathematics performance. In student level, home resources, parents' education, students' confidence and like mathematic have a positive direct effect. That model also revealed a cross-level interaction between school level and student level. It is economy disadvantage (economy background of student in one school) which had moderating effect to home resource toward mathematic performance (ICC coeeficient = -3.81, SE = 1.40). The negative value indicates economic disadvantage variable would decrease the effect of home resource variable toward mathematic performance.

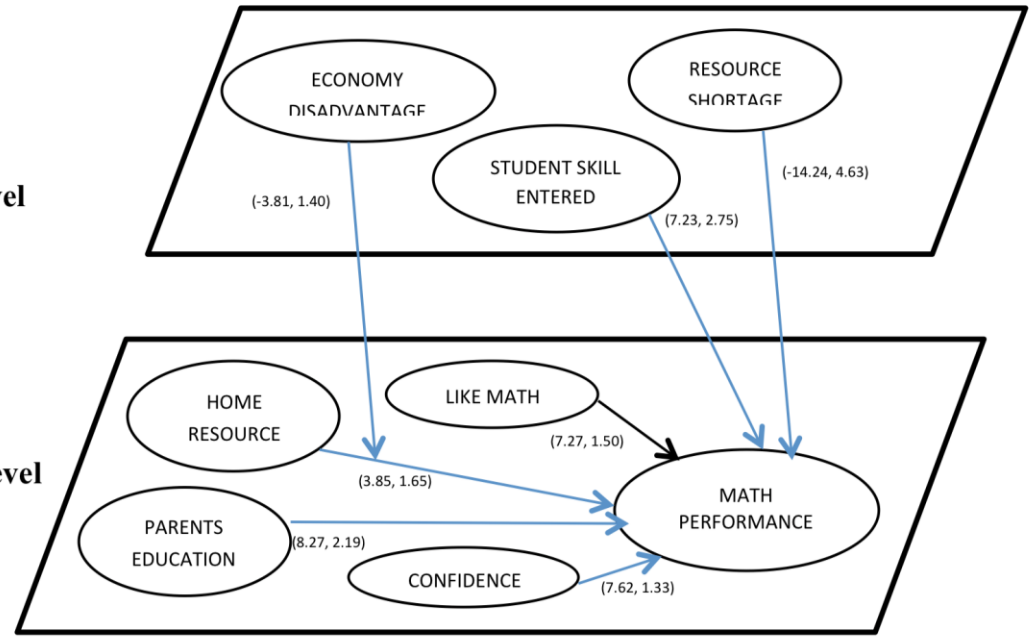


Figure 2. HLM Results of The Fixed and Random Effects of The Final Models. Index Showing (ICC Coefficient, Standard Error)

Table 5 shows the variance explained from each level by calculating the changes of null model variance and final model variance. Variance explained from students and school levels were 17% and 44%, whereas total variance explained were 28%.

Table 5. Variance Explained from Each Level

	Null Model Variance	Final Model Variance	Variances Explained
Student (level 1)	4340.9289	3615.82264	.167039423
School (level 2)	2967.09493	1654.30934	.442448126
Total	7308.02383	5270.13198	.278856760

Discussion

Indonesia rank in TIMSS study provokes a desire to examine factors that determine students' performance in mathematics. Using two layers hierarchical linear modeling, the findings of this research describe that school and student factors had a significant influence in mathematic performance. School level variance explained by this model was sizeable (44%) to describe the importance of this factor to enhance mathematic performance. This finding also reveals school factors variables that contribute to mathematics performance. From several variables that tested in school layer, there were two variables that had significant direct effect to mathematics performance, i.e. literacy and numeracy skills when students enter the school, and resource shortage. Economy disadvantage variable had no significant direct effect to mathematics performance, but influence home resource effect to mathematics performance in student level.

This finding highlights the role of instructional support in school to enhance mathematic achievement. Consistent with previous study revealing school factors raised achievement (Fuller, 1987), which found that specific material input (instructional media and material in school, library, and laboratories) had a positive relationship with mathematics achievement in most third world countries. Questions asked in TIMSS questionnaire that describe resource shortage at schools are availability of computer technology, audiovisual resources, calculator, concrete objects, and science equipment in teaching math. This issue also became a problem in Indonesia, especially in public schools, which have limitation in media and technology support in learning. Limited education budget, especially in rural areas seems to become the source of problem. Although, policy makers has been encouraged the using of ICT in teaching and learning (Pannen, 2015), but the fact there are at least three problems that might be still occurred in Indonesia 1) limitation of material and technology equipment for teaching and learning mathematics due to limited budget, 2) teacher or technology staff competencies in using technology in their class is still limited, 3) the access and availability has not been distributed equally (for example the connection issue, etc). Although Indonesian government has made serious effort to provide program and infratrusture but we still facing four-core problem as stated by Nizam & Santoso (2013), they are diversity, disparity, scalability and sustainability.

Another variable that also had a significant effect to mathematic performance is literacy and numeracy skills when students enter the school. Purpura et al. (2011) found that early literacy skills uniquely predict early numeracy skills development. Children's numerical competence in kindergarten is highly predictive of their acquisition of mathematics in Grade 1 and Grade 2 (LeFevre, 2009). This finding suggests the importance of developing literacy and numeracy skill in preschool and at home to support child readiness in mathematics learning. Somehow, the issue "do we have to teach reading and counting in kindergarten?" still emerged in Indonesian people. Pro and con about this issue might be give influence to students' mathematic performance.

In this study, economy disadvantage in school level became a mediator in home resource influence towards mathematics performance. This finding suggests that lower students' economic background in school would decrease the effect of home resource toward mathematics performance. Economic disadvantages make the family difficult to meet the needs of conducive children environment in learning. This finding consistent with Demira et al. (2010) study that socio economic was one of factors that increase mathematics performance. This cross-level interaction highlight that school socio-economic status influences mathematic performance. Student with higher socio-economic status perform poorly in poor schools, but poor students attending affluent schools improve their reading and math skills. Spaull's (2011; 2013) research in Africa further identified, schools with two type systems, namely-wealthy functional schools and poor dysfunctional schools and the role they play in provides quality education to learners. These findings show that schools with fewer resources also have less skilled teachers, while schools with more resources attract to good quality teachers. As in Africa, this result showed that Indonesia still faces the challenges of equity, diverse needs, and the right to fair participation in education and the quality of education services.

Student level variance explained by this model was 17%, there were four variables that had significant effect to mathematic performance, i.e. students like mathematic, students' confidence in mathematics, parents' education, and home resource. This finding also consistent with previous studies, which revealed students factors that influence mathematics performance. We can divide into internal and external factor variables in this level. This study amplify earlier finding that students interest and confidence in math as internal factors play important role on students mathematic performance. Meanwhile, parents' education and home resources as external factor also have contribution to student mathematic performance. These findings explain the importance of family resource to facilitate their children development in learning math. Lopez et al. (2007) research found that family resources such as parents' educational level, occupation and income predicted home literacy activities that in turn predicted students' literacy and numeracy skill when they entered school.

Something different found in this study is gender had no significant effect anymore to mathematics performance. This finding is consistent with meta-analysis studies from countries participating in TIMSS and PISA, showing that, on average, there is little difference in math performance between men and women (Linn et al., 2010). It is consistent with the predictions of the gender stratification hypothesis and psychological theory assumed by Eccles (1994), Bandura (1986), and Eagle and Wood (1999) that if girls are given the necessary educational tools, are encouraged to succeed, and if they have a good visible female role model in math, girls will perform at the same level as the boys mate.

Considering Creemer's framework, this study highlights the quality and characteristic of school, students' motivation, and social economic background as a significant factor that determine mathematics performance in year four Indonesian students. Economic background seems play an important role both in school level and student level. This finding suggests a recommendation to provide economic assistance to school, including giving better technology and material support to school. *Kartu Indonesia Pintar* (KIP) became a good policy to help students financially that can be used to meet their learning needs. Fairness and equity have to be main concern in every policy. Student' motivation such as self-confidence and a sense of love for mathematics lesson also became an important factor to consider. Schools and parents can develop those positive perceptions by creating a positive climate and giving a fulfilling prophecy about mathematics.

Conclusion

Utilizing two layers hierarchical linier modeling, this study is able to answer three research questions asked. This study reveals several variables that tested in school layer, and found there were two variables that had significant direct effect to mathematics performance, i.e. literacy and numeracy skills when students enter the school, and resource shortage. Whereas economy disadvantage variable had no significant direct effect to mathematics performance, but influence home resource effect to mathematics performance in student level. It means there is cross-level interaction between school-level and student-level factors. In student level, there were four variables that had significant effect to mathematic performance, i.e. students like mathematic, students' confidence in mathematics, parents' education, and home resource. School level variance explained by this model was 44%, meanwhile student level variance explained by this model was 17%, and total variance explained were 28%.

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