Original Paper
［査読有り］原著論文

# A study on factors affecting the academic achievements of fifth-grade students in the Republic of the Union of Myanmar
## - Secondary analysis of SEA-PLM 2019 -

**Hiromitsu MUTA**

Institute of Human Culture Studies, Otsuma Women's University
12 Sanban-cho, Chiyoda-ku, Tokyo, 102-8357 Japan

Key words：Academic achievement, SEA-PLM, Influential factors, Fifth-grader, International comparative study

**Abstract**

In 2019, a standardized academic achievement survey in mathematics, reading, and writing was conducted for fifth-grade students in six ASEAN countries, including Myanmar, and the results were released in 2020. Myanmar ranked in the middle of the six countries surveyed. The most important policy factor explaining academic achievements was the match between the language of instruction, the Myanmar language, and the language used by students at home. When the language at home was not the Myanmar language, students were clearly less proficient, especially in writing, but there were also differences in mathematics. The language problem was especially serious in the lower-achieving groups.

Factors that also contributed to improving academic achievement were increasing the students' positive perception toward school, fewer problematic behavior by teachers, availability of lesson time, a short commute time to school, a small grade size, and a good physical learning environment. Parents' active involvement in their children's learning, expectations for their children's education, and exemption from excessive household workload were also effective in improving academic achievement. Improvements can also be made through educational activities for parents.

## 1 Introduction

Numerous studies have been conducted to determine what factors contribute to student academic achievement. Coleman et al. (1968), a classic study of quantitative analysis in academic achievement research, analyzed large-scale data from the United States and found that when the factors contributing to academic achievement were divided into school-related factors and home-related factors, the explanatory power of the home-related factors, expressed as socioeconomic status (SES), had the greatest explanatory power [1]. This conclusion has since become the mainstream of research on factors contributing to academic achievement. For example, Sirin (2005) showed in a meta-analysis of 74 studies published between 1990 and 2000 that SES had medium to strong relation to academic achievement overall, despite different ways of measuring it [2].

Subsequently, the proliferation of international comparative surveys of academic achievement such as PISA, TIMSS, and PERL has provided much of the data needed for such analyses, and the spread of meta-analytic methods which statistically analyze the results of many studies has confirmed the importance of SES in more recent research as well.

Ciftci et al. (2017), in a meta-analysis of 66 studies, found that SES had a high impact on student achievement [3]. Luo (2022), in a meta-analysis of 326 studies based on data from 1990 to 2021, found a moderate correlation between SES and academic achievement and that the relationship has become stronger since the 1990s [4].

Perry et al. (2022) used the 2018 PISA data to calculate whether the effect of school SES on reading, mathematics, and science achievement varied by level of academic performance using a quantile regression analysis method and showed that school SES was highly explanatory regardless of levels of academic performance [5]. Michael et al. (2023) used data from 38 European countries participating in the 2018 PISA to show that SES affects academic achievement through motivation, such as enjoyment of learning and expected occupational status, to learn [6]. Wang et al. (2023) conducted a meta-analysis of 156 studies on PISA and found that grade level and overall family SES were consistently positively related to academic achievement in mathematics, five factors including student absenteeism & lack of punctuation were negatively related, and other 14 factors showed various positive and negative relationships depending on the study [7].

However, even if the meta-analysis can show that different types of SES were important factors in explaining academic achievement in many studies, the magnitude of the effect varied and, of course, there were research findings that showed small effects of SES, raising the question of why and what other important factors besides SES could be controlled for in policy. The World Bank has accumulated a relatively large amount of data on the social impacts of its loans to education projects, and in line with its lending objectives, the World Bank has calculated the future benefits of its loans to education projects in many developing countries. Hyneman et al. (1983), who analyzed a large number of such data from developing countries, showed that school factors, especially teacher performance, were important in explaining academic achievement in low-income countries, a conclusion that differed from the results of previous studies of factors affecting academic achievement based on data from developed countries [8]. Among developing countries, some studies showed that school factors were still more important explanatory factors than family factors even in recent years in low-income countries (Tomita and Muta 2012) [9]. Some studies showed that the contribution of SES was smaller in less developed regions within the same country (e.g. Tomul et al. 2009) [10].

One reason for this is that in countries/regions with high economic standards, variation in the socioeconomic environment of families is greater than variation in the quality of schools and teachers, and in countries/regions with low economic standards, variation in the quality of schools and teachers is greater than variation in the socioeconomic environment of families, suggesting that interventions in schools may be effective in improving academic achievement.

Even in countries with high economic standards, some studies have found that school-related factors are important. You (2015), in an analysis using South Korean data from the 2012 PISA data, found that 41.5% of the variance in mathematics achievement was explained by school-related variables, contrary to Coleman et al.'s findings, which explained the importance of education policies [11].

Many efforts are being made in every country to improve the academic achievement of students. However, it is not always clear which policies are important for improving academic achievement, and the situation is not consistent across countries and regions. There may also be a variety of factors related to schools that can be changed by policy: Tan et al. (2021) found 493 effects related to school leadership, such as classroom management, teacher capacity building, and outreach to external stakeholders and others, from 108 studies published since 2000, with effect sizes ranged from r=.10 to r=.26 [12]. Based on 40 studies from 2000 to 2019, Lopez-Martin et al. (20-23) found that teacher characteristics and competencies explained 9.2% of the differences in academic achievement, overall effect was moderate, illustrating the importance of teacher capacity building [13].

Although personal factors of students can be considered as contributing factors to academic achievement, some of these factors can be changed through the efforts of schools and teachers. For example, Korpershoek, H. et al. (2020), in a meta-analysis of 82 studies from 2000 to 2018, found that students' sense of belonging to their school played an

important role in their performance [14]. Tao et al. (2022) conducted a meta-analysis of 71 studies and found a small to medium correlation between students' perceived teacher support and their academic achievement [15].

Kocak, O. et al. (2021) conducted a meta-analysis of 169 meta-analytic studies on factors contributing to academic achievement published till 2018 and found 427 effect sizes for 254 variables, showing that classroom-based physical activities had the largest effect size, although the effect size for SES was large [16].

Although the goals of basic education may vary, such as improving the skills of students and contributing to the development of the country through that improvement, neither the outcome nor the impact can be expected unless the expected academic achievement is first achieved as an output of basic education. Although there are many studies on the factors that influence academic achievement worldwide, the results of these studies differ in terms of the policy implications of their findings, which depend largely on the conditions of each country. Therefore, in order to formulate effective education policies in Myanmar, it is necessary to conduct an analysis based not only on the findings of previous studies, but also on Myanmar's own data.

The EGRA/EGMA is a sample-based survey of academic achievement in Myanmar. However, the test questions are not standardized, and the grades are limited to the lower grades of the primary school course (the World Bank 2015) [17].

Muta analyzed the end-of-grade pass rates for Grade 5 and Grade 9 in Chin State (2015) and Mandalay Region (2016), using grade size as one of the explanatory variables [18][19]. The results showed that the smaller the grade size, the higher the pass rate for Grade 5, and a certain grade size was more explanatory for Grade 9. The study also showed that there were large differences among districts, and that the smaller the number of students per teacher, the higher the pass rate for Grade 5 and Grade 9.

Muta (2019) considered the results of previous analyses and included more explanatory variables. By including primary schools in all states/regions of the country in the analysis, the study analyzed the issues as a whole in Myanmar across states/regions. The results showed the importance of the learning environment and the provision of the required number of teachers [20].

However, because these analyses were limited to school-based indicators, the scope of the analyses was limited. For this type of analysis, it is desirable to have standardized indicators to measure achievement and data on individual students and their parents. In 2019, a standardized test (SEA-PLM: Southeast Asia Primary Learning Metrics) that can be compared to results in other countries was administered for the first time to Grade 5 students in Myanmar (Spink 2018) [21]. These data are expected to inform future education policies.

## 2 Purpose

SEA-PLM 2019 is a project in which six ASEAN countries (Cambodia, Lao PDR, Malaysia, Myanmar, the Philippines, and Vietnam) measured the academic achievements of fifth-grade students in mathematics, reading, and writing in 2019 using standardized PISA-type common questions (about 5,000 students per country). The SEA-PLM Secretariat held a presentation of the results on December 1 and 2, 2020 and released the Main Regional Report [22]. At the same time, the questionnaires and data sets used in the survey were disclosed. The survey provided meaningful information for understanding the level of mathematics, reading, and writing practices and learning outcomes across six ASEAN countries. In addition, extensive information on students, classrooms, schools, teachers, principals, parents, and communities was collected using a series of background questionnaires in order to explore policies to improve learning outcomes.

The Main Regional Report contained a comparison of basic statistics among the six countries, but it did not provide a detailed analysis of each country and mainly focused on country comparisons. Data was collected not only on the academic achievements of students, but also on their attitudes toward learning, parental expectations and the home environment, the learning environment of schools, and the educational

methods and attitudes of teachers. However, perhaps due to the scope of the paper, very little detailed analysis was made of the interrelationships among these variables. Since the sampling was done carefully, the national estimates were easy to obtain. There were many related variables and secondary analyses of various factors related to academic achievements were possible.

It is necessary to conduct a multi-country analysis to determine the relative level of academic achievement in Myanmar and its characteristics, but this part was mainly covered by the Main Regional Report. First, detailed analysis was conducted only on data for Myanmar. For example, clues for policies to improve academic achievements were obtained by analyzing what were the major factors that affected academic achievements in Myanmar. In addition, devising analytical methods may provide insight for the need for different policies that benefit students with poor academic performance and policies that benefit students with a relatively good academic performance.

## 3 Methods

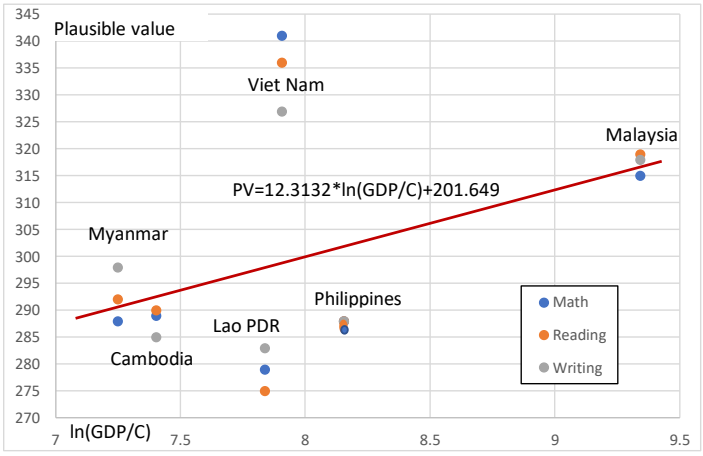
The total number of students surveyed in Myanmar was 5,707. The following sections used this data to clarify Myanmar's position among the six ASEAN countries, followed by an analysis of the factors contributing to academic performance using Myanmar's data. The SEA-PLM Secretariat disclosed the questionnaires and datasets used for the survey, but the test questions themselves were not disclosed as they will be used in part in the future. The SEA-PLM analysis was based on the item response theory (estimating the underlying academic achievement from the test performance,) and the estimation of the population variance was done by using the jackknife method, a resampling statistical method, to correct for sampling error caused by two-stage sampling [23]. Therefore, it is necessary to understand the complex procedures leading to the various analyses. (See attached Appendix1, Technical Notes).

## 4 Results of Macro Analysis Based on International Comparison of Six ASEAN Countries

### 4.1 Characteristics of Myanmar in the Main Regional Report

Since the Main Regional Report provided basic analysis on academic achievements and various variables, the results were reviewed first. In general, it is known that there is a strong correlation between standardized test scores and GDP/C, which indicates the level of development of a country, regardless of the grade level. The higher the level of a country's development, the better the system, including the educational system, and the more resources that can be invested, which makes it convincing as common sense. Currently, in addition to the OECD's PISA, there are a number of standardized international assessment systems such as TIMSS, PIRLS, SACMEQ, LLECE, PASEC, etc., which cover different regions, grades, and subjects. There have also been attempts to combine the results of different types of surveys using the scores of countries participating in several surveys (e.g., [24]).

Figure 1 shows the relationship between the three types of academic achievement (mathematics, reading, and writing) and the GDP/C of the six countries. The three types of academic achievement (Plausible Value) were adjusted so that the average of the six ASEAN countries was 300 and the standard deviation was 30. Interpreting the average academic




Source: [22] Table2.2, 2.6, 2.9

Figure 1: Relationship between Academic Achievements and GDP/C

achievement estimate for Myanmar with a 95% confidence interval, it can be said that Myanmar ranked third in mathematics, behind Vietnam and Malaysia but equal to Cambodia and the Philippines; third in reading, behind Vietnam and Malaysia but equal to Cambodia; and third in writing, behind Vietnam and Malaysia.

The trend line was a line obtained based on 6 countries x 3 academic achievements. It was close to the line connecting Malaysia, the country with the highest GDP/C, and Myanmar, the country with the lowest GDP/C, partly due to the small sample size. Vietnam was higher than the trend line, while Laos and the Philippines were noticeably lower. In terms of the absolute value of the academic achievement scores (Plausible Values,) Myanmar ranked third among the six countries. But in terms of the deviation from the trend line, Myanmar ranked second to Vietnam and tied with Malaysia for second and third place. This must be good news for the Myanmar's Ministry of Education.

Myanmar had handicaps compared to the other five countries. For example, the standard age for fifth grade in Myanmar was 9 years old, while the standard age for all other countries was 10 years old. The difference in growth over this one year is huge. In addition, while the academic achievements measured in SEA-PLM were those that could be applied to real life situations based on a modern view of academic proficiencies, Myanmar's fifth-graders in 2019 were still being educated according to an old, memory-based curriculum. Rote learning has been transformed into new learning system of the 21st century with the new curriculum since the year 2016/17 [25]. Overcoming such handicaps, the results of the study have shown more than what was expected from GDP/C.

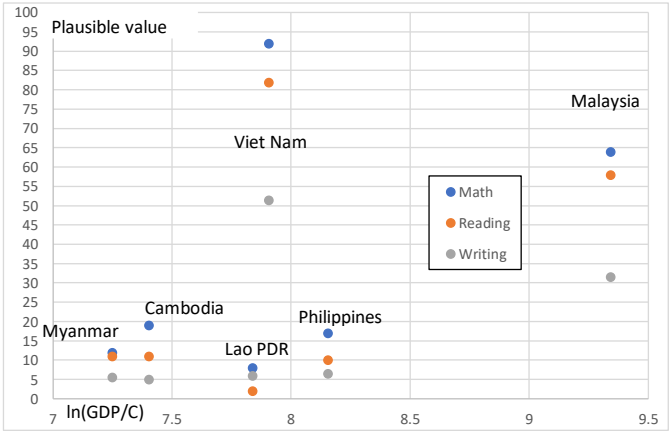
Goal 4 of the SDGs is "quality education for all". Whether or not the Target 4.1, "relevant and effective learning outcomes" have been achieved cannot be measured by average scores alone. There is naturally a strong relationship between academic achievement scores and "what students can do," and SEA-PLM 2019 showed the distribution of "what students can do" by dividing academic achievement scores into several levels (Bands). For mathematics and reading, the criteria for what needs to be "done" were set by UNESCO's Global Alliance to Monitor Learning (GAML). According to the Main Regional Report, a minimum of Band 4 in mathematics and Band 3 in reading were considered to be sufficient for completion of lower primary education, and a minimum of Band 6 in mathematics and reading were considered to be sufficient for completion of primary education. Although there was no international standard for writing, Band 6 was considered to be sufficient for completion of primary education followed by mathematics and reading.

Students with a mathematics proficiency scale of Band 6 can perform mathematical operations, including fractions, and interpret tables and graphs. “Children can convert a fraction in tenths to its decimal equivalent. They have a firm grasp of place value and rounding in numbers up to 5 digits. They can solve problems involving measuring devices requiring conversion of metric units of length and capacity. They can calculate the mass of objects using a balance. Children can add 30 minutes to a given time. They can visualize 3-dimensional objects from 2-dimensional representations and interpret a simple map using directional language. They can interpret a frequency table and a line graph showing growth over time.” ([22] p.53).

In reading, students with proficiency scale of Band 6 and above can understand texts with familiar structure and manage competing information. “Children are able to understand texts with familiar structures and manage competing information when locating ideas and details. They are able to find multiple pieces of related information in texts with familiar structures and make connections between details and ideas to draw inferences. They are able to use clues and explicit information to support inferences even when there is competing information. They are also able to identify the most likely reasons for events and the reactions of characters in narratives, where that information is only implied in the text.” ([22] p.42).

And in writing, students with proficiency scale of Band 6 can write simple texts for a range of purposes

with above basic vocabulary. “Children can produce texts that relate to local and personal contexts, presenting simple writing with some supporting details. They can produce sequenced writing that a reader can follow easily, but they are still learning to use linguistic devices to create cohesion within their texts. At this level, children’s vocabulary is basic and beyond; it may be adequate to convey the detail of a message, for example, in a short, formal note.” ([22], p.47).




Source: [22] Table2.1, 2.5, 2.8

Figure 2: Percentage of Students with Academic Achievement, Band 6 or Higher

Figure 2 shows the percentage of students with a Band 6 or higher by academic achievements. Vietnam and Malaysia were outstandingly high, while the other four countries were generally low. Myanmar was significantly lower than Cambodia in mathematics, and significantly higher than Laos in reading. While it is important to raise the average scores, policy efforts are needed to ensure that as many students as possible acquire academic proficiency appropriate for the final year of primary school, the fifth grade.

### 4.2 Academic Achievement by Classification Category

The average academic achievement score varied by various classification categories. Table 1 shows the extent to which the average academic achievement estimates varied by country in the various classification categories, such as differences by gender, differences in whether or not the language of instruction was the same as the language used at home, differences between the highest and lowest groups of quartiles of the SES index, differences between the highest and lowest groups of quartiles of the grade size, and differences between the highest and lowest groups of quartiles of the various learning-related resources index in the school neighborhood as indicators. SES was a composite variable

Table 1: Differences in Academic Achievements by Country and Factor Category

| Factor | | Gender | Language at home & instruction | SES quarter | School size quarter | School area resource quarter |
|---|---|---|---|---|---|---|
| Category 1 | | Girl | Same | Top | Top | Top |
| Category 0 | | Boy | Not | Bottom | Bottom | Bottom |
| Math | Cambodia | 3.4 | 11.3 | 18.0 | 12.0 | 12.0 |
| | Lao PDR | -0.2 | 11.7 | 23.0 | 12.0 | 14.0 |
| | Malaysia | 3.2 | 5.9 | 22.0 | 11.0 | 13.0 |
| | Myanmar | 0.4 | 9.7 | 13.0 | 1.0 | 5.0 |
| | Philippines | 2.3 | -2.7 | 26.0 | 10.0 | 15.0 |
| | Viet Nam | 0.1 | 19.2 | 24.0 | 12.0 | 15.0 |
| | Average | 1.6 | 9.2 | 21.0 | 10.0 | 12.0 |
| Reading | Cambodia | 6.9 | 10.4 | 19.0 | 13.0 | 12.0 |
| | Lao PDR | 1.8 | 12.5 | 22.0 | 11.0 | 14.0 |
| | Malaysia | 9.0 | 12.2 | 20.0 | 7.0 | 10.0 |
| | Myanmar | 2.9 | 15.7 | 14.0 | 1.0 | 7.0 |
| | Philippines | 5.8 | 0.0 | 30.0 | 11.0 | 17.0 |
| | Viet Nam | 3.6 | 21.5 | 25.0 | 16.0 | 17.0 |
| | Average | 5.0 | 12.1 | 22.0 | 10.0 | 13.0 |
| Writing | Cambodia | 11.9 | 13.3 | 17.0 | 13.0 | 13.0 |
| | Lao PDR | 8.3 | 18.5 | 28.0 | 15.0 | 22.0 |
| | Malaysia | 11.3 | 7.0 | 14.0 | 3.0 | 7.0 |
| | Myanmar | 7.3 | 18.2 | 10.0 | -1.0 | 5.0 |
| | Philippines | 11.2 | -5.3 | 34.0 | 13.0 | 18.0 |
| | Viet Nam | 10.6 | 17.8 | 20.0 | 10.0 | 13.0 |
| | Average | 10.1 | 11.6 | 20.0 | 9.0 | 13.0 |

Source: [22] Table3.2, 3.9-3.11, 3.19, 3.23-3.25, 3.28-3.30
Note: Figures in red were not significant differences.

(first principal component) of parental occupation, education, and assets at home, and neighborhood learning environment resources was a composite variable (first principal component) of the presence or absence of 12 facilities such as public libraries.

As can be seen from Table 1, there were significant differences in most of the factors and countries, but by country, the differences in the other four factors, except for the difference between the language of instruction and the home language, were significantly smaller in Myanmar among the six countries. In other words, it was suggested that Myanmar was providing generally equal quality education with less differences depending on factors such as those shown here. Of course, there were serious problems with the language of instruction and home language. It was understandable that this difference was larger in reading and writing than in mathematics. For students who did not speak the Myanmar language, the language of instruction as their home language, reading and writing proficiencies were the same as learning a foreign language, and more ingenuity in teaching methods has been needed.

Table 2 shows the regression coefficients by regression analysis to show the extent to which various factors can explain academic achievement, rather than a consideration by the difference in academic achievement between two groups. Here, the regression coefficients were shown by gender, school location (urban or rural,) and parental socioeconomic status (SES). For example, the variance that can be explained by these three variables for achievement scores in mathematics was calculated to be 18% on average, with 28% being the highest in the Philippines and 12% being the lowest in Myanmar. Similarly, achievement scores in reading averaged 20%, with the highest in the Philippines at 36% and the lowest in Myanmar at 12%, and achievement score in writing averaged 17%, with the highest in the Philippines at 28% and the lowest in Myanmar at 9%.

Table 2: Regression Coefficients for Factors on Academic Achievement by Country

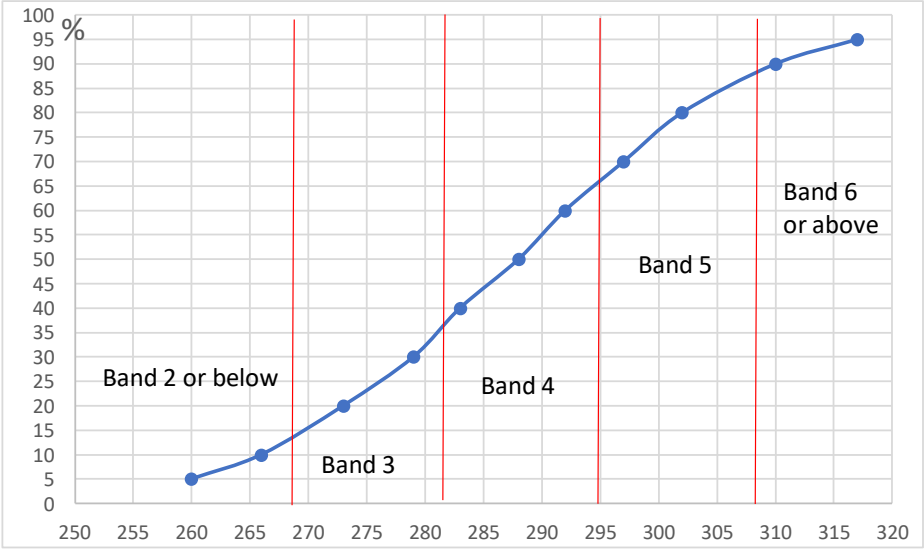
| Factor | | Gender | School location | SES | Variance explained | Standard error |
|---|---|---|---|---|---|---|
| Category 1 | | Girl | Urban | | (%) | |
| Category 0 | | Boy | Rural | | | |
| Math | Cambodia | 3.7 | 19.5 | 6.2 | 19 | 2.8 |
| | Lao PDR | 0.4 | 0.4 | 9.2 | 19 | 2.5 |
| | Malaysia | 2.7 | 2.7 | 8.3 | 17 | 1.9 |
| | Myanmar | 0.2 | 0.2 | 5.4 | 12 | 1.9 |
| | Philippines | 3.1 | 3.1 | 9.5 | 28 | 2.7 |
| | Viet Nam | 0.0 | 0.0 | 9.2 | 15 | 1.9 |
| | Average | 1.7 | 4.3 | 7.9 | 18 | 0.9 |
| Reading | Cambodia | 7.1 | 12.8 | 7.1 | 18 | 2.1 |
| | Lao PDR | 2.5 | 2.5 | 9.1 | 19 | 2.4 |
| | Malaysia | 8.6 | 8.6 | 7.8 | 14 | 1.6 |
| | Myanmar | 2.5 | 2.5 | 5.7 | 12 | 1.8 |
| | Philippines | 6.8 | 6.8 | 10.6 | 36 | 2.9 |
| | Viet Nam | 3.6 | 3.6 | 9.0 | 18 | 1.8 |
| | Average | 5.2 | 6.1 | 8.2 | 20 | 0.9 |
| Writing | Cambodia | 12.1 | 13.5 | 6.1 | 13 | 1.4 |
| | Lao PDR | 9.0 | 9.0 | 11.1 | 15 | 2.1 |
| | Malaysia | 11.0 | 11.0 | 5.6 | 17 | 1.6 |
| | Myanmar | 7.0 | 7.0 | 4.2 | 9 | 1.5 |
| | Philippines | 12.2 | 12.2 | 12.5 | 28 | 2.3 |
| | Viet Nam | 10.6 | 10.6 | 7.3 | 17 | 1.7 |
| | Average | 10.3 | 10.6 | 7.8 | 17 | 0.7 |

Source: [22] Table3.12-3.14
Note: Figures in red were not significant differences.

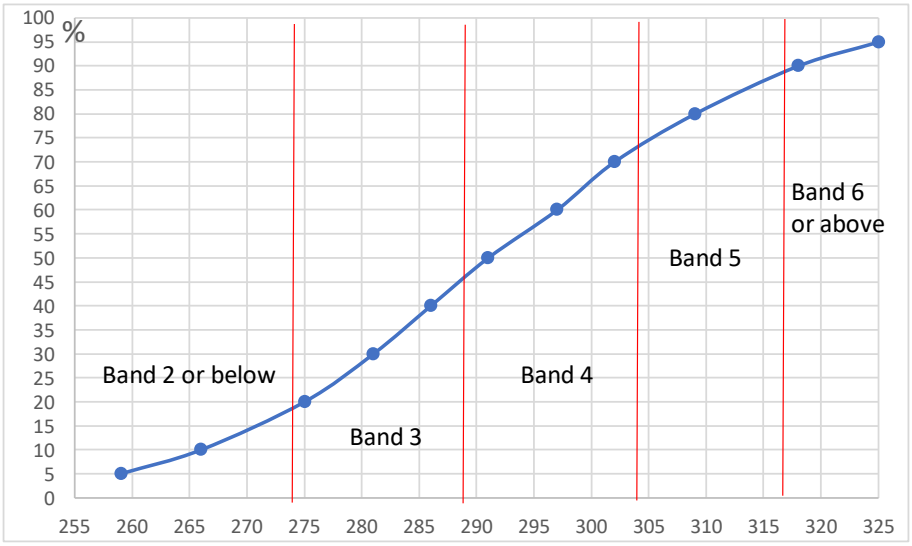
While it was desirable from the perspective of equal learning opportunity that learning achievement did not depend much on these commonly considered factors, it begged the question of what else could explain academic achievement. It is necessary to include variables in the analysis that can be easily intervened in terms of policy to deepen the discussion.

### 4.3 Academic Achievement in Myanmar

In the previous section, the position of Myanmar's academic achievements among the ASEAN countries was examined. In the following section, a closer look at Myanmar's academic achievement was analyzed, but before the detailed analyses of academic achievement in Myanmar were examined, some of the statistics on




Source: [22] Table2.10
Note: The red vertical lines show the boundaries of Bands.
Figure 3: Cumulative Distribution of Academic Achievement Score in Mathematics

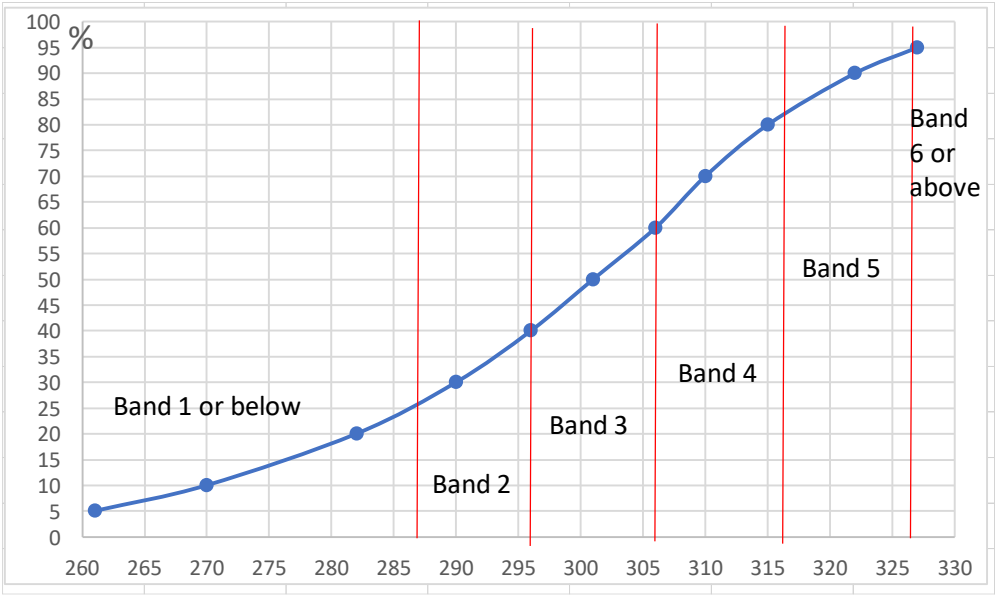



Source: [22] Table2.3
Figure 4: Cumulative Distribution of Academic Achievement Score in Reading

Myanmar's academic achieve-ments which were found in the Main Regional Report were reviewed.

Figure 3 shows the distribution of academic achievement scores in mathematics. The score for students with 5 percentile from the lowest was 260 points, but the score for the 50 percentile was 288 points, which did not reach six ASEAN countries' average. In order to score 300 points, students needed to be in the 76 percentile, and in order to exceed the Band 6 standard of 308 points, they needed to be in the 88 percentile. There were many students who did not even have the proficiency of a third-grade primary school student. With the ongoing reform of the current curriculum, it is expected that these new academic proficiencies will be acquired, but further guidance of various kinds will be necessary.

Figure 4 shows the distribution of scores in reading academic achievement. The students in the lowest 5




Source: [22] Table2.7

Figure 5: Cumulative Distribution of Academic Achievement Score in Writing

percentile scored 259 points, and the 50 percentile scored 291 points, which was below the average of the six ASEAN countries. A value of 66 percentile was required to achieve 300 points, and a value of 89 percentile was required to exceed the Band 6 reference value of 317 points. There were many students who did not even have third grade ability, a 19 percentile below Band 2.

Figure 5 shows the distribution of academic achievement scores in writing. The score of students with the 5 percentile from the lowest was 261 points, while the score of the 50 percentile value in the middle was 301 points, which was almost equal to the average of the six ASEAN countries. However, a 95 percentile was needed to exceed the Band 6 standard of 327 points.

## 5 Results of National Analysis Focused on Measures to Improve Academic Achievement in Myanmar

### 5.1 Student-Based Analysis

#### 5.1.1 Results of Regression Analysis

In the previous section, through a comparison of six ASEAN countries, it was shown that the academic achievements of Myanmar's fifth-graders in mathematics, reading, and writing was better than expected considering the country's level of economic development; and the gaps in academic achievements due to various factors were relatively small. Nevertheless, there were still many areas for improvement compared to the expected academic achievements according to the SDG 4.1 standard, and it was clear that there were large differences in learning achievements among individuals. This section focuses on data from Myanmar and conducts some detailed analysis with the aim of obtaining suggestions that will lead to an improvement of future academic achievement measures.

The basic idea was to conduct regression analyses with three types of academic achievement as the explained variables and the variables related to students, parents, teachers, and schools as the explanatory variables, and then to examine the obtained regression coefficients. In order to conduct regression analyses, it was necessary to use the same unit of data. In order to do so, it was the most rational to combine other data with the students' data, which had a large number of samples. The sample size of the student data was 5,707, but the sample size of the parent data was 5,371, which was nearly a one-to-one correspondence, although it did not correspond to some student data. The sample size of schools was

202, so the same school data was adapted for all students belonging to the same school. The problem was the teacher data. The sample size of the teacher data was 432, which was more than twice as large as the sample size of the school data, because in many cases more than one teacher in one school responded to the questionnaire. The teacher questionnaire included a question on whether the teacher was in charge of the class for which the data was collected. Therefore, if there was one teacher in charge of the class, the data of that teacher was used, if there were multiple teachers, the average of those teachers was used, and if there was no teacher in charge of the class, the average of all the teachers was used in that school and matched with the students' data.

In Tables 1 and 2, several variables related to students, families, and schools were listed as factors that explained academic achievement. While referring to them, and also taking into account various past literature, explanatory variables were considered from among the variables that were available as data. Given the large number of explanatory variables to be considered and the fact that there were strong correlations among these explanatory variables, significant variables were selected by using a stepwise method of gradually increasing and decreasing variables. Then, in order to compare the variables explaining the three types of academic achievement with each other, all the variables that could significantly explain at least one of the three types of academic achievement in the regression analysis were used, and the regression analyses with the same set of variables were conducted. The resulting variables used were as follows. The detailed definitions of each variable were given in the Appendix 2.

Variables related to students

Attributes (gender, age, language used at home, ability at entry (parent questionnaire))

Motivation to learn (positive perception toward school, problematic behaviors (school questionnaire))

Learning time (learning time of mathematics)

Variables related to home environment

SES (synthetic variables created by ACER which supported the technical aspects of SEA-PLM) [26]

Home environment (household workload (student questionnaire))

Parental educational expectations (educational expectations, parental encouragements (student questionnaire))

Variables related to teachers

Motivation (problematic behaviors (student questionnaire))

School-related variables

Scale (number of fifth-grade students)

Location (urban/rural, commuting time to school (student questionnaire))

Educational conditions (physical learning environment (teacher questionnaire: composite variable of availability of various facilities))

Table 3 shows the variables that explain academic achievement in mathematics. The regression coefficients indicated how many points the explained variable, mathematics achievement, was expected to change when the explanatory variable used changed by one unit. However, since the units used were different for each explanatory variable, it was not possible to compare which variable changed the mathematics achievement significantly by comparing the size of the regression coefficient. In order to see which variables had relatively larger effects, it was better to look at the t-values or the standardized regression coefficients (β-values) where the units were unified to the standard deviation of each explanatory variable. In addition, the values in this table basically showed the results of regression analysis for the average of the five Plausible Values in mathematics with basic weights to adjust for sampling error and estimate robust standard errors.

The SEA-PLM source data also provided weights for the jackknife method of re-estimation. The same analysis was conducted using the method of estimating standard errors by the re-estimation method for each of the five Plausible Values and combining the results [2], but the regression coefficients were the same and the difference in the results was only the standard errors shown in Table 3. The two kinds of standard errors in Table 3 varied

Table 3: Results of Regression Analysis Explaining Academic Achievement in Mathematics Based on Students as the Measuring Unit

| Math_PVave | | Coef. | Std. Err. | t | P>t | Beta | *SE |
|---|---|---|---|---|---|---|---|
| Student survey | Age -9 | -1.793 | 1.057 | -1.700 | 0.090 | -0.050 | 1.583 |
| | Age 10 | -0.572 | 0.977 | -0.590 | 0.558 | -0.019 | 1.326 |
| | Age 11 | -1.889 | 1.077 | -1.750 | 0.079 | -0.045 | 1.403 |
| | Gender Girl | -1.878 | 0.526 | -3.570 | 0.000 | -0.061 | 0.610 |
| | Language Myanmar | 4.591 | 0.714 | 6.430 | 0.000 | 0.117 | 1.365 |
| | SES Indicator | 4.820 | 0.301 | 16.010 | 0.000 | 0.302 | 0.479 |
| | Math lesson hours | 1.924 | 0.232 | 8.280 | 0.000 | 0.145 | 0.417 |
| | Preference for school | 6.455 | 0.515 | 12.540 | 0.000 | 0.213 | 1.018 |
| | Troubling teachers | 2.062 | 0.331 | 6.220 | 0.000 | 0.116 | 0.551 |
| | House works | -0.883 | 0.441 | -2.000 | 0.045 | -0.036 | 0.752 |
| | Parents' involvement | 2.918 | 0.319 | 9.150 | 0.000 | 0.178 | 0.637 |
| Parent | Capabilities when entrant | 2.786 | 1.332 | 2.090 | 0.037 | 0.039 | 2.293 |
| | Expecting edu. level | 0.758 | 0.292 | 2.600 | 0.009 | 0.047 | 0.454 |
| School/ teacher survey | Ln (#of G5 students) | -1.542 | 0.317 | -4.860 | 0.000 | -0.097 | 0.601 |
| | Location Rural | -1.233 | 0.629 | -1.960 | 0.050 | -0.038 | 1.153 |
| | Hindering issues | 2.165 | 1.022 | 2.120 | 0.034 | 0.033 | 2.142 |
| | Commuting time | 3.278 | 0.629 | 5.210 | 0.000 | 0.089 | 0.947 |
| | Learning environment | 7.230 | 1.738 | 4.160 | 0.000 | 0.077 | 3.681 |
| Constant | | 235.830 | 4.838 | 48.750 | 0.000 | | 6.279 |
| | Number of observation= | 2,858 | *SE=calculated using replication method | | | | |
| | F (18, 2839)= | 94.060 | Prob>F= | 0.000 | | | |
| | R-squared= | 0.421 | | | | | |

from 1.2 times to 2.1 times depending on the explanatory variables. This meant that the t-value decreased from 1/1.2 to 1/2.1 times. When reading the calculation results, mistakes in interpretation would be avoided, if it was understood that the standard errors associated with the confidence intervals of the regression coefficients changed depending on the estimation method of standard error and it was important to focus only on variables with sufficiently large t-values.

Judging from the high t-values and β-values in Table 3, it was clear that if SES was high, academic achievement in mathematics was high, but it was difficult to change the SES as a policy. The tendency for boys to be more proficient in mathematics also cannot be changed. However, as for the high t-value and β-value of the language at home was the Myanmar language, for example, it was possible to improve academic achievement by assigning assistant teachers, who were fluent in the local home language, and developing supplementary teaching materials.

There was a strong tendency for academic achievement to be higher if the students' positive perception toward school was higher, so there was a room for improvement through school management and teaching methods. The fact that academic achievement was higher when teachers had fewer behavioral problems also relate to improving school management through education policy.

The lesson time for mathematics study, the short commuting time to school, the small size of the fifth grade, and the excellent physical learning environment of the school were also important policy variables for high academic achievement. Of course, parents' active involvement in their children's learning and their expectations for their children's education were also important. It is possible to increase these expectations through educational activities for parents.

Table 4: Results of Regression Analysis Explaining Academic Achievement in Reading Based on Students as the Measuring Unit

| Read_PVave | | Coef. | Std. Err. | t | P>t | Beta | *SE |
|---|---|---|---|---|---|---|---|
| Student survey | Age -9 | -2.029 | 1.275 | -1.590 | 0.112 | -0.048 | 2.174 |
| | Age Age 10 | -0.646 | 1.173 | -0.550 | 0.582 | -0.018 | 1.758 |
| | Age 11 | -4.114 | 1.286 | -3.200 | 0.001 | -0.084 | 1.723 |
| | Gender Girl | 0.442 | 0.604 | 0.730 | 0.464 | 0.012 | 0.765 |
| | Language Myanmar | 9.172 | 0.843 | 10.880 | 0.000 | 0.202 | 1.794 |
| | SES Indicator | 4.862 | 0.349 | 13.910 | 0.000 | 0.262 | 0.593 |
| | Math lesson hours | 2.070 | 0.271 | 7.640 | 0.000 | 0.134 | 0.449 |
| | Preference for school | 7.778 | 0.648 | 12.010 | 0.000 | 0.220 | 0.997 |
| | Troubling teachers | 2.048 | 0.378 | 5.420 | 0.000 | 0.099 | 0.542 |
| | House works | -2.294 | 0.515 | -4.450 | 0.000 | -0.080 | 0.871 |
| | Parents' involvement | 2.872 | 0.358 | 8.030 | 0.000 | 0.151 | 0.578 |
| Parent | Capabilities when entrant | 3.044 | 1.478 | 2.060 | 0.040 | 0.036 | 2.754 |
| | Expecting edu. level | 0.905 | 0.350 | 2.580 | 0.010 | 0.048 | 0.489 |
| School/ teacher survey | Ln (#of G5 students) | -1.620 | 0.359 | -4.520 | 0.000 | -0.088 | 0.714 |
| | Location Rural | -2.391 | 0.719 | -3.320 | 0.001 | -0.063 | 1.249 |
| | Hindering issues | 2.596 | 1.240 | 2.090 | 0.036 | 0.034 | 2.622 |
| | Commuting time | 0.481 | 0.708 | 0.680 | 0.497 | 0.011 | 0.999 |
| | Learning environment | 7.900 | 1.972 | 4.010 | 0.000 | 0.072 | 4.017 |
| Constant | | 234.439 | 5.910 | 39.670 | 0.000 | | 8.253 |
| Number of observation= | | 2,858 | *SE=calculated using replication method | | | | |
| F (18, 2839)= | | 96.120 | Prob>F= | | 0.000 | | |
| R-squared= | | 0.418 | | | | | |

Table 4 shows the same analysis for reading: The higher the SES, the higher the students' positive perception toward school, and the higher the academic achievement, as in the case of mathematics. In addition, the fact that the t-value and β-value of language at home was the Myanmar language was much higher than in the case of mathematics, which was to be expected since the subject was about language. The amount of time spent studying mathematics was also significantly higher, but this was interpreted as a variable that expressed length and motivation to study, regardless of the specific subject of mathematics.

Parents' active involvement in their children's study and their expectations for their children's education were also significantly high as in mathematics, but the household workload at home was negatively and significantly higher than in the case of mathematics. The same was true for mathematics: The less problematic the teacher's behavior, the higher the academic achievement.

It was the same as in the case of mathematics. The smaller the grade size, the higher the academic achievement, but the fact that the region was rural had a more negative effect than in the case of mathematics. Reading proficiency was probably more affected by the region than proficiency in mathematics.

Table 5 shows the variables that explain the academic achievement in writing. The t-value and β-value that reflected the home language as Myanmar was the highest when compared to academic achievement in reading as well as in mathematics. For whom did not speak the Myanmar language at home, it was just a foreign language. Cultural background seemed to be more important in learning how to write than reading proficiency. Being a girl had a positive effect on writing, as opposed to mathematics, where SES had the same positive impact as in mathematics and in reading.

Academic achievement was higher when the students' positive perception toward school was greater, when the number of problematic teachers was less, and the grade size was small as in the case of mathematics and reading proficiency. The fact that

Table 5: Results of Regression Analysis Explaining Academic Achievement in Writing Based on Students as the Measuring Unit

| Write_PVave | | Coef. | Std. Err. | t | P>t | Beta | *SE |
|---|---|---|---|---|---|---|---|
| Student survey | Age -9 | 2.824 | 1.238 | 2.280 | 0.023 | 0.069 | 2.139 |
| | Age 10 | 2.938 | 1.181 | 2.490 | 0.013 | 0.083 | 1.869 |
| | Age 11 | 0.252 | 1.331 | 0.190 | 0.850 | 0.005 | 1.645 |
| | Gender Girl | 5.210 | 0.595 | 8.750 | 0.000 | 0.148 | 0.794 |
| | Language Myanmar | 13.919 | 0.945 | 14.740 | 0.000 | 0.312 | 2.203 |
| | SES Indicator | 3.233 | 0.334 | 9.670 | 0.000 | 0.178 | 0.660 |
| | Math lesson hours | 1.260 | 0.268 | 4.690 | 0.000 | 0.083 | 0.425 |
| | Preference for school | 7.513 | 0.653 | 11.510 | 0.000 | 0.217 | 1.196 |
| | Troubling teachers | 1.976 | 0.350 | 5.650 | 0.000 | 0.098 | 0.677 |
| | House works | -0.202 | 0.496 | -0.410 | 0.683 | -0.007 | 0.985 |
| | Parents' involvement | 0.667 | 0.336 | 1.990 | 0.047 | 0.036 | 0.558 |
| Parent | Capabilities when entrant | 4.755 | 1.554 | 3.060 | 0.002 | 0.058 | 3.180 |
| | Expecting edu. level | 0.869 | 0.344 | 2.530 | 0.012 | 0.047 | 0.551 |
| School/ teacher survey | Ln (#of G5 students) | -2.083 | 0.329 | -6.320 | 0.000 | -0.115 | 0.754 |
| | Location Rural | -2.461 | 0.701 | -3.510 | 0.000 | -0.066 | 1.643 |
| | Hindering issues | 3.062 | 1.061 | 2.890 | 0.004 | 0.041 | 2.616 |
| | Commuting time | 1.175 | 0.695 | 1.690 | 0.091 | 0.028 | 1.132 |
| | Learning environment | 7.597 | 1.943 | 3.910 | 0.000 | 0.070 | 5.228 |
| Constant | | 233.322 | 5.818 | 40.110 | 0.000 | | 10.356 |
| Number of observation= | | 2,858 | *SE=calculated using replication method | | | | |
| F (18, 2839)= | | 76.040 | Prob>F= | | 0.000 | | |
| R-squared= | | 0.408 | | | | | |

the region was rural had a negative effect, as in the case of reading proficiency.

### 5.1.2 Results of Quantile Regression Analysis

In the results of the regular regression analysis in the previous section, the regression coefficients in Tables 3 to 5 indicated how much academic achievement was expected to change when each explanatory variable increased by one unit. Therefore, academic achievement can basically improve by changing the variables that can be changed from a policy standpoint among the variables with large standardized regression coefficients. However, this result was pointing to an average across all academic achieving groups. As a practical matter, some variables might be more effective in lower-achieving groups, or conversely, some factors might be more effective in higher-achieving groups. Even if academic achievement is important for all students, if the policy intention is to narrow the gap between academic achievement by raising the level of the lower- achieving group in particular, it is necessary to consider the implementation of policies that are particularly effective for the lower-achieving group.

Furthermore, if academic proficiencies are structured, especially in mathematics, the task of the next step cannot be accomplished if the task at one level has not been learned. It is important to teach differently according to the level of academic achievement. For example, if we can't do addition, we can't understand multiplication, and if we can't do multiplication, we can't do division.

The quantile regression analysis method can be used as a method to perform regression analysis according to academic achievement strata. In order to clarify the differences among academic achievement strata, the regression coefficients were estimated for each quantile (10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, and 90%,) counting from the lowest. Due to software limitations, the average of the five Plausible Values was used for the academic achievement estimate, and although basic weighting was used to

adjust for the two-stage sampling error, robust standard errors were estimated without re-estimating the errors. The results were illustrated in Figures 6 through 8. These figures show the regression coefficients shown in Tables 3 to 5, their upper and lower 95% confidence intervals, and the regression coefficients at each of the above quantiles, their upper and lower 95% confidence intervals. Therefore, only the variables were focused on whose quantile regression coefficients varied significantly beyond the 95% confidence intervals of the regular regression coefficients.

Figure 6 shows the results of the quantile regression analysis explaining the academic achievement in mathematics. The regression coefficients changed most significantly with quantile for SES, which had an average of 0.0 and a standard deviation of 1.0. From the regular regression analysis, it was expected that a 1-point increase in SES score would result in a 4.82-point increase in mathematics achievement. However, the results of the quantile regression showed that the effect of SES was larger for the group with higher academic achievement: 4.02 points for a quantile of 10%, and 5.72 points for a quantile of 90%. This result was understandable considering that many resources were needed to achieve high academic achievement, such as parental cooperation and the home learning environment, in addition to intelligence and effort by the student.

For the other variables, there was a certain amount of variation in the regression coefficients depending on the quantiles, but there were no other factors that clearly exceed the 95% confidence interval of the regression coefficients in the general regression analysis other than SES.

Figure 7 shows the results of the quantile regression analysis explaining academic achievement in reading. For SES, there was no significant difference between quantiles as in the case of mathematics. The average for positive perception of students toward school was 3.53 with a standard deviation of 0.530. On average, a 1-point increase in favor was associated with a 7.78-point increase in reading proficiency, but the effect was higher for students with intermediate academic ability, 9.52 points at the 50% quantile and 5.21 points at the 90% quantile. Other factors, such as parental educational expectations and the school learning environment, were relatively high at the 90% quantile.

Figure 8 shows the results of the quantile regression analysis explaining the academic achievement in writing. Contrary to the case in mathematics, the regression analysis showed that an increase of 1 point in SES score was expected to result in an increase of 3.23 points in writing ability, but the quantile regression results showed that the effect of SES was larger for the lower ability group, 4.55 points for the 10% quantile and 2.42 points for the 80% quantile. The effect of SES was higher for the lower academic achieving groups.

The most significant difference by quantiles was whether the home language was the Myanmar language or not. According to the regression analysis, if the home language was the Myanmar language, a 13.92-point increase in writing achievement could be expected compared to cases where the language was not the Myanmar language. However, the results of quantile regression showed that the effect of language was larger for the lower-achieving group, 20.50 points for the 10% quantile, and it was 7.78 points for the 90% quantile. These may be because the students with higher academic achievement were able to overcome to some extent the handicaps of low SES and different languages. There were tendencies that the regression coefficients for gender differences and positive perception toward school tended to be smaller for the high academic achieving group, but these could be interpreted in the same way.

Thus, it was clear that among the three types of academic achievements, writing achievement was the most culturally influenced and mathematics achievement was the most socioeconomically influenced. Of course, it was important to further raise the academic achievement of students with high academic proficiency in order to develop their potential, but in order to guarantee a standard academic achievement for all students, based on the idea of "no one left behind," it was essential to provide adequate instruction to students with low academic proficiency.

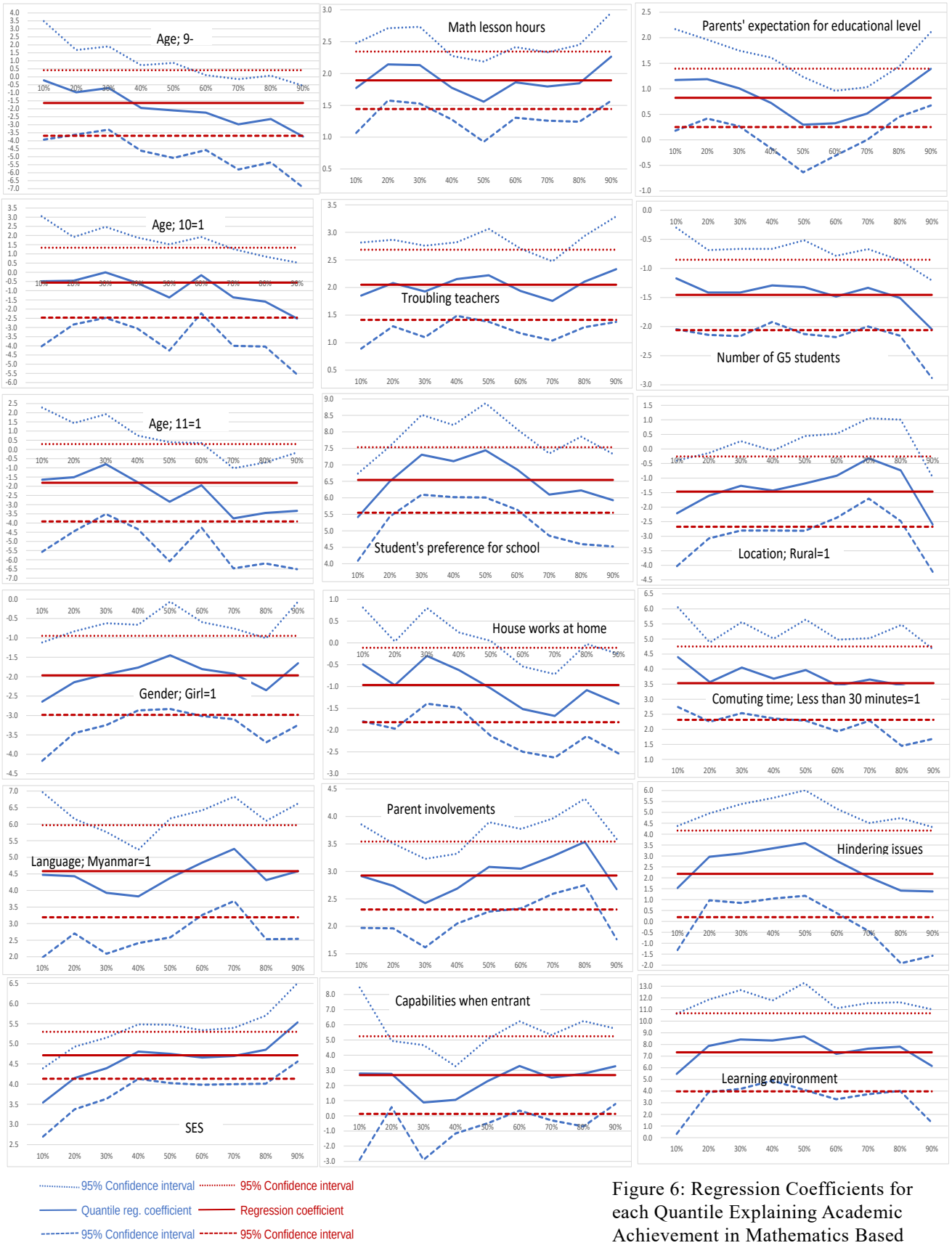



Figure 6: Regression Coefficients for each Quantile Explaining Academic Achievement in Mathematics Based on Students as the Measuring Unit

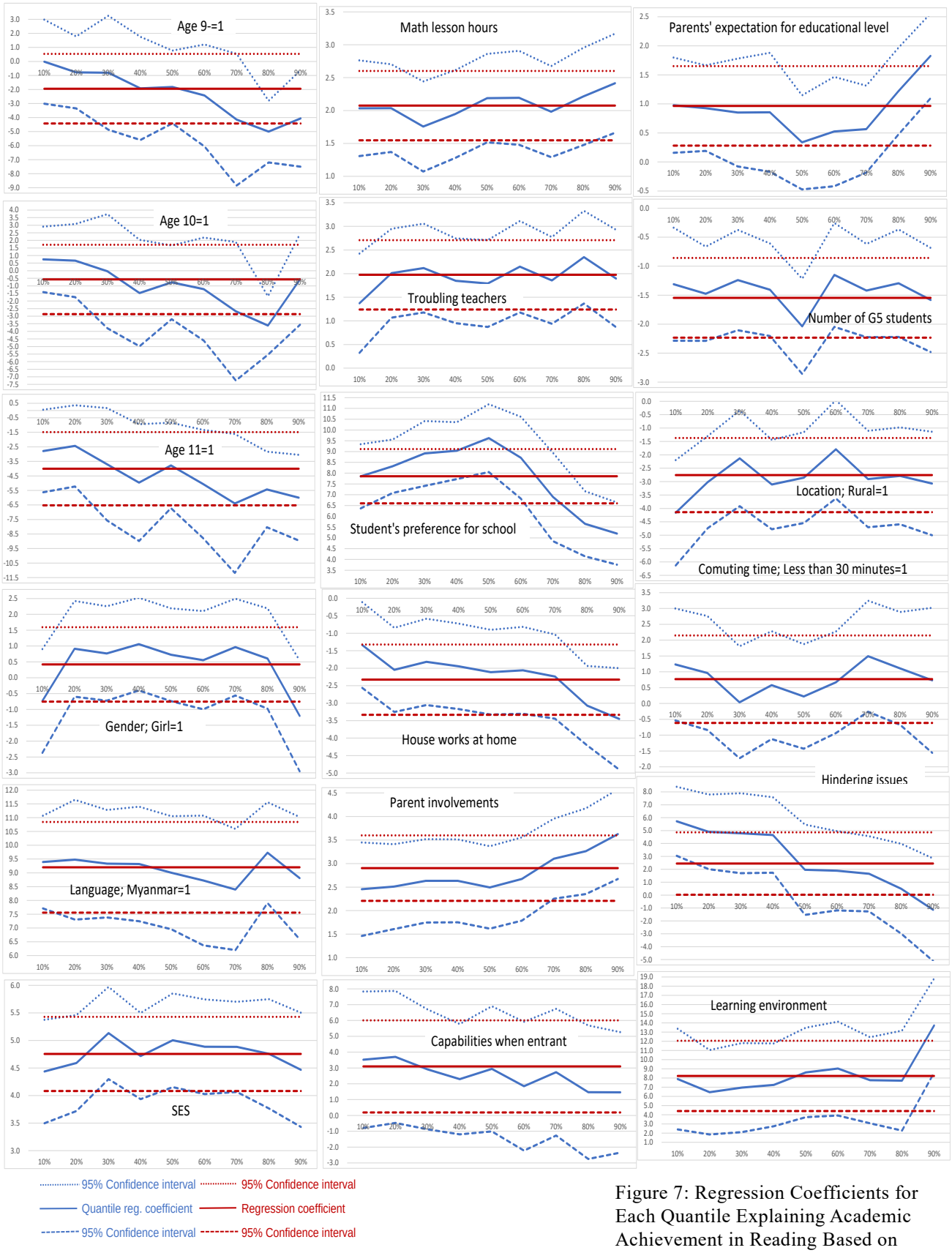



Figure 7: Regression Coefficients for Each Quantile Explaining Academic Achievement in Reading Based on Students as the Measuring Unit

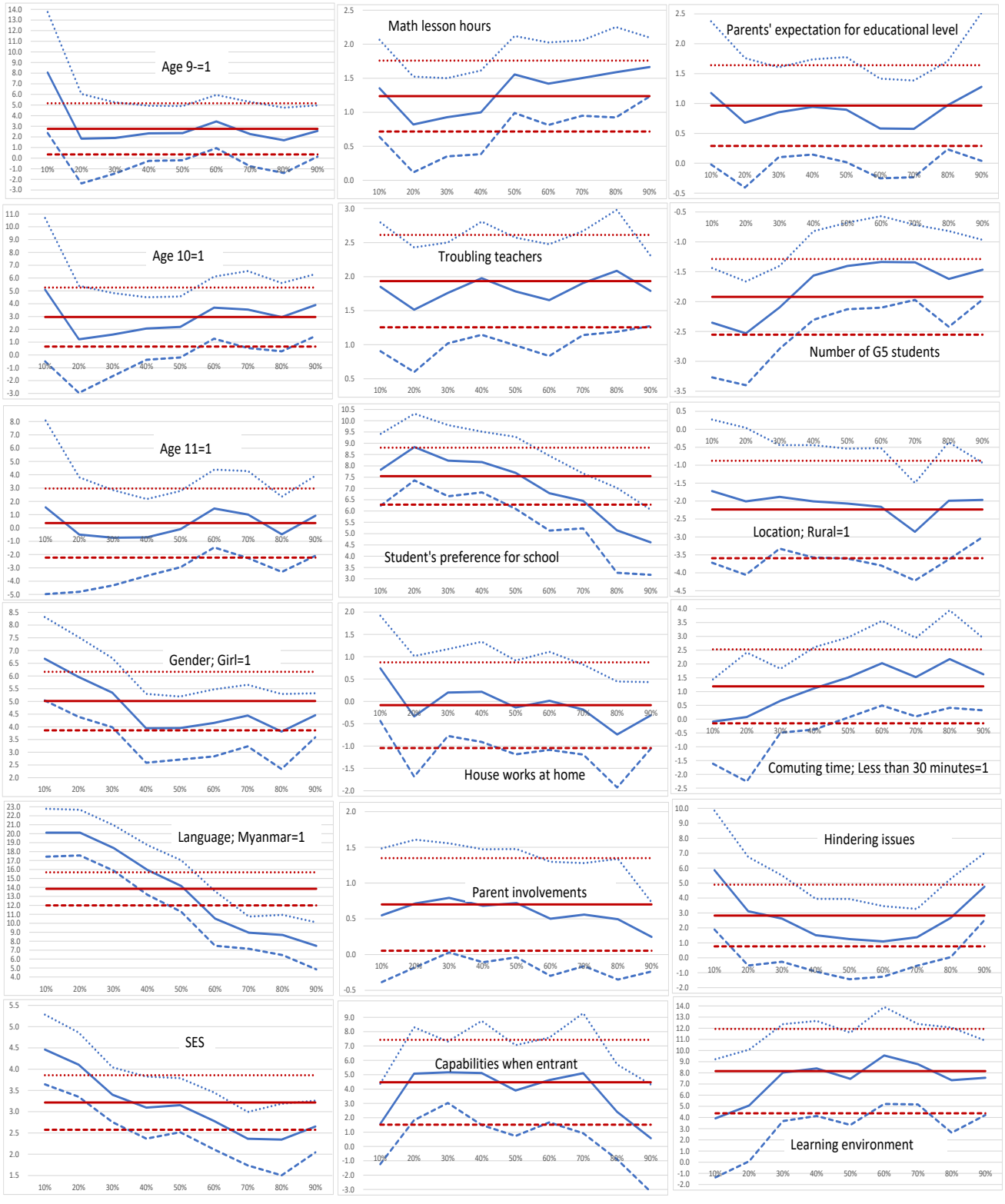



Figure 8: Regression Coefficients for Each Quantile Explaining Academic Achievement in Writing Based on Students as the Measuring Unit

Among the fifth-graders of the survey, 23.81% did not speak the Myanmar language as their home language. Learning the Myanmar language is necessary not only for understanding subject content, but also for establishing one's identity as a Myanmar citizen. In particular, it is necessary to take measures to ensure that students, who do not use Myanmar language as their home language, are not disadvantaged, such as using the home language at school in conjunction with reading and writing instruction especially in the lower grades.

### 5.1.3 Analysis of Students' Positive Perception toward School

From Tables 3 to 5 and Figures 6 to 8, it can be seen that students' positive perception toward school was an important factor in improving their academic achievement. Making students like school was the first step to improving this. What factors can explain this positive perception toward school? Table 6 shows the results of a regression analysis using variables with significant regression coefficients, focusing on the factors used in Tables 3 through 5.

The R-squared was 0.095, which was not large, but among the explanatory variables used in the model equation, the fact that the home language was the Myanmar language had the highest standardized coefficient. This was followed by a short commuting time to school, the mathematics lesson hour, fewer problematic teachers, and exemption from excessive household workloads. It will be necessary to provide assistant teachers for students whose home language is not the Myanmar language, to properly conduct classes in which order is maintained in schools, and to avoid difficulties in commuting to school.

## 5.2 Teacher-Based Analysis

### 5.2.1 Results of Regression Analysis

In the previous section, in order to analyze students as the measuring unit, the information on teacher data was used in a compressed form, producing averages by school. Nevertheless, it was clear from the results of the analyses that the information in the teacher data provided effective information for estimating the academic achievement of the students. Therefore, similar analyses were conducted using all the teachers' data as the measuring unit of the analyses. In other words, data for schools, students, and parents were incorporated into the teachers' data for analysis. For the data of students and parents, the average values for each school unit were used and the same analyses were conducted as in the previous section.

Table 7 shows the results of regression analysis explaining academic achievement in mathematics based on teachers as the measuring unit of analysis. High SES, high parental involvement in education and expectations of students' education, home language being the

Table 6: Factors Explaining Students' Positive Perception toward School Based on Students as the Measuring Unit

| Preference for school | | | Coef. | Std.Err. | t | P>t | Beta | *SE |
|---|---|---|---|---|---|---|---|---|
| Student survey | Age | Age -9 | 0.088 | 0.028 | 3.090 | 0.002 | 0.074 | 0.039 |
| | | Age 10 | 0.055 | 0.025 | 2.240 | 0.025 | 0.054 | 0.029 |
| | Gender | Girl | 0.053 | 0.018 | 2.860 | 0.004 | 0.051 | 0.020 |
| | Language | Myanmar | 0.198 | 0.026 | 7.590 | 0.000 | 0.163 | 0.052 |
| | SES | Indicator | 0.022 | 0.010 | 2.190 | 0.029 | 0.042 | 0.013 |
| | Math lesson hours | | 0.041 | 0.009 | 4.700 | 0.000 | 0.092 | 0.011 |
| | Troubling teachers | | 0.043 | 0.011 | 3.840 | 0.000 | 0.073 | 0.016 |
| | House works | | -0.059 | 0.015 | -3.860 | 0.000 | -0.073 | 0.023 |
| | Parents' involvement | | 0.024 | 0.010 | 2.410 | 0.016 | 0.045 | 0.013 |
| School/ teacher survey | Location | Rural | 0.048 | 0.020 | 2.420 | 0.016 | 0.045 | 0.037 |
| | Commuting time | | 0.118 | 0.023 | 5.200 | 0.000 | 0.097 | 0.030 |
| Constant | | | 3.045 | 0.060 | 51.100 | 0.000 | | 0.104 |
| Number of observation= | | | 3,789 | *SE=calculated using replication method | | | | |
| F (11,3777)= | | | 22.640 | Prob>F= | | 0.000 | | |
| R-squared= | | | 0.095 | | | | | |

Table 7: Results of Regression Analysis Explaining Academic Achievement in Mathematics Based on Teachers as the Measuring Unit

| Math_PV ave | | Coef. | Std. Err. | t | P>t | Beta | *SE |
|---|---|---|---|---|---|---|---|
| Student survey | Language Myanmar | 5.588 | 1.390 | 4.020 | 0.000 | 0.196 | 9.728 |
| | SES Indicator | 5.373 | 0.678 | 7.920 | 0.000 | 0.365 | 2.685 |
| | Preference for school | 6.642 | 2.223 | 2.990 | 0.003 | 0.172 | 3.547 |
| | Troubling teachers | 1.321 | 1.536 | 0.860 | 0.390 | 0.059 | 21.495 |
| | House works | -1.075 | 1.535 | -0.700 | 0.484 | -0.034 | 3.839 |
| | Parents' involvement | 6.134 | 1.355 | 4.530 | 0.000 | 0.292 | 1.818 |
| Parent | Expecting edu. level | 1.995 | 1.060 | 1.880 | 0.061 | 0.114 | 6.608 |
| School/ teacher survey | Ln (#of G5 students) | -1.754 | 0.405 | -4.330 | 0.000 | -0.172 | 1.006 |
| | Hindering issues | -2.919 | 1.625 | -1.800 | 0.073 | -0.071 | 3.819 |
| | Commuting time | -0.524 | 1.761 | -0.300 | 0.766 | -0.011 | 22.381 |
| | Learning environment | 0.534 | 0.180 | 2.970 | 0.003 | 0.124 | 9.042 |
| | Student assessment | 4.906 | 2.360 | 2.080 | 0.038 | 0.098 | 22.567 |
| Constant | | 238.072 | 7.690 | 30.960 | 0.000 | | 32.471 |

Number of observation= 339　*SE=calculated using replication method
F (12, 326)= 52.91　Prob>F= 0.000
R-squared= 0.671

Myanmar language, students' positive perception toward school, good learning environment in school, and small grade size were the factors for high academic achievement in mathematics the same as in the analysis based on students as the measuring unit. One variable that differed from the analysis on a per student basis was the significance of whether or not the teacher had received training in student assessment. It is interesting to note that teacher training was effective in improving academic achievement.

Table 8 similarly shows regression analysis results to explain academic achievement in reading based on teachers as the measuring unit. SES had the highest t-value and β-value as in the case of mathematics, but whether the home language was Myanmar was the next highest values. This result made sense because of the

Table 8: Results of Regression Analysis Explaining Achievement in Reading Based on Teachers as the Measuring Unit

| Read_PV ave | | Coef. | Std. Err. | t | P>t | Beta | *SE |
|---|---|---|---|---|---|---|---|
| Student survey | Language Myanmar | 10.111 | 1.961 | 5.160 | .000 | .292 | 11.861 |
| | SES Indicator | 6.322 | .889 | 7.110 | .000 | .354 | 3.982 |
| | Preference for school | 10.121 | 3.042 | 3.330 | .001 | .215 | 7.342 |
| | Troubling teachers | 2.496 | 1.720 | 1.450 | .148 | .092 | 12.960 |
| | House works | -2.848 | 2.036 | -1.400 | .163 | -.073 | 7.774 |
| | Parents' involvement | 4.894 | 1.484 | 3.300 | .001 | .192 | 1.783 |
| Parent | Expecting edu. level | 2.785 | 1.363 | 2.040 | .042 | .131 | 5.447 |
| School/ teacher survey | Ln (#of G5 students) | -1.771 | .517 | -3.420 | .001 | -.143 | 3.026 |
| | Hindering issues | -2.589 | 2.253 | -1.150 | .251 | -.052 | 2.074 |
| | Commuting time | -5.676 | 2.223 | -2.550 | .011 | -.096 | 29.072 |
| | Learning environment | 0.551 | 0.216 | 2.550 | .011 | .105 | 0.428 |
| | Student assessment | 4.908 | 1.951 | 2.520 | .012 | .081 | 7.079 |
| Constant | | 230.580 | 11.533 | 19.990 | .000 | | 56.036 |

Number of observation= 339　*SE=calculated using replication method
F (12, 326)= 53.48　Prob>F= 0.000
R-squared= 0.676

nature of the subject. The following high t-value and β-value were the parents' involvement in education and high expectations for their children's education, the students' positive perception toward school, the school's good learning environment, and the small grade size as in the case of mathematics.

Table 9 similarly shows the results of the regression analysis explaining academic achievement in writing based on teachers as measuring unit. Whether or not the home language was the Myanmar language, data showed the highest t-value and β-value, which was the same as the analysis results based on students as the measuring unit (Table 5). This was followed by SES and students' positive perception toward school. Other significant variables were small grade size and whether or not the teacher has received training in student assessment.

Thus, due to the nature of the subjects, whether or not the home language was the Myanmar language, it was the most influential variable in writing, followed by reading and mathematics. SES, students' positive perception toward school, and grade size, as well as whether or not teachers were trained in student assessment, were significant variables across the three subjects.

### 5.2.2 Results of Quantile Regression Analysis

In this section, the more detailed analysis results were shown through quantile regression analysis. Figures 9, 10, and 11 show the results of the quantile regression analysis that explains the academic achievement in mathematics, reading, and writing, respectively. The impact of whether or not the language used at home was the Myanmar language varied markedly by academic achievement in writing, and the impact was particularly large for the group with the lowest academic achievement in writing. In order to eliminate dropouts and guarantee a certain level of academic achievement for everyone, it was essential to have assistant teachers who were fluent in the local home language.

Positive parental intervention was more effective in the higher academic tiers, but it was particularly evident in writing. Smaller grade sizes were more effective in lower-achieving students in mathematics and reading proficiency. This was probably because more careful instruction was expected.

### 5.2.3 Analysis of Students' Positive Perception toward School

Table 10 shows the various factors that explain the students' positive perception toward school based on

Table 9: Results of Regression Analysis Explaining the Achievement in Writing Based on Teachers as the Measuring Unit

| Write_PV ave | | Coef. | Std. Err. | t | P>t | Beta | *SE |
|---|---|---|---|---|---|---|---|
| Student survey | Language Myanmar | 16.281 | 2.460 | 6.620 | 0.000 | 0.456 | 6.456 |
| | SES Indicator | 5.635 | 0.969 | 5.820 | 0.000 | 0.305 | 13.358 |
| | Preference for school | 10.742 | 4.130 | 2.600 | 0.010 | 0.221 | 23.544 |
| | Troubling teachers | 3.720 | 1.917 | 1.940 | 0.053 | 0.133 | 0.857 |
| | House works | 0.691 | 2.284 | 0.300 | 0.763 | 0.017 | 8.808 |
| | Parents' involvement | -0.260 | 1.649 | -0.160 | 0.875 | -0.010 | 7.830 |
| Parent | Expecting edu. level | 0.629 | 1.401 | 0.450 | 0.654 | 0.029 | 13.081 |
| School/ teacher survey | Ln (#of G5 students) | -2.358 | 0.556 | -4.240 | 0.000 | -0.184 | 8.149 |
| | Hindering issues | -3.373 | 2.207 | -1.530 | 0.127 | -0.065 | 22.027 |
| | Commuting time | -4.108 | 2.732 | -1.500 | 0.134 | -0.068 | 23.397 |
| | Learning environment | 0.500 | 0.284 | 1.760 | 0.080 | 0.093 | 18.232 |
| | Student assessment | 7.333 | 2.168 | 3.380 | 0.001 | 0.117 | 3.760 |
| Constant | | 242.010 | 14.279 | 16.950 | 0.000 | | 38.187 |
| Number of observation= | | 339 | *SE=calculated using replication method | | | | |
| F (12, 326)= | | 26.97 | Prob>F= | | 0.000 | | |
| R-squared= | | 0.623 | | | | | |

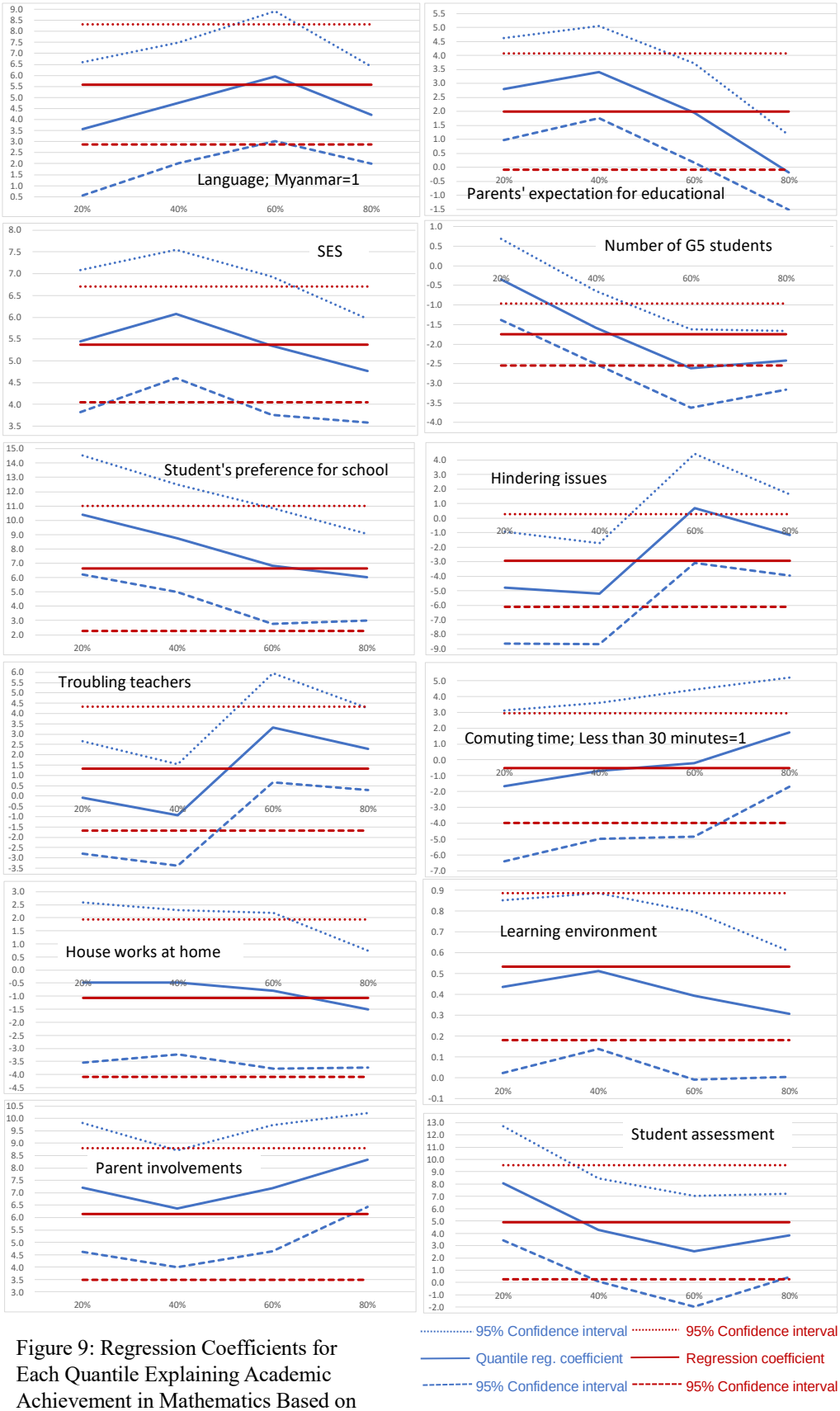



Figure 9: Regression Coefficients for Each Quantile Explaining Academic Achievement in Mathematics Based on Teachers as the Measuring Unit

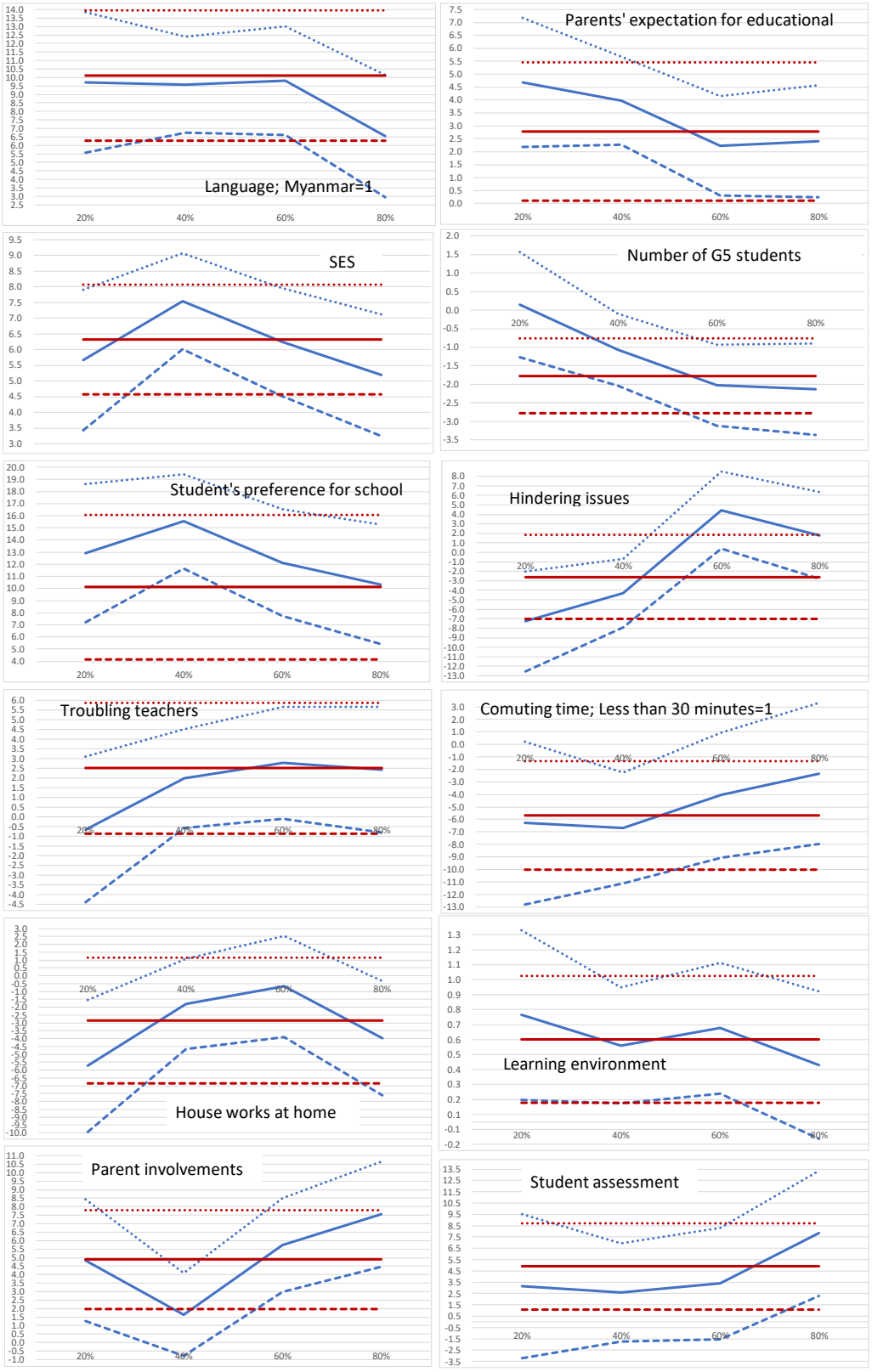



Figure 10: Regression Coefficients for Each Quantile Explaining Academic Achievement in Reading Based on Teachers as the Measuring Unit

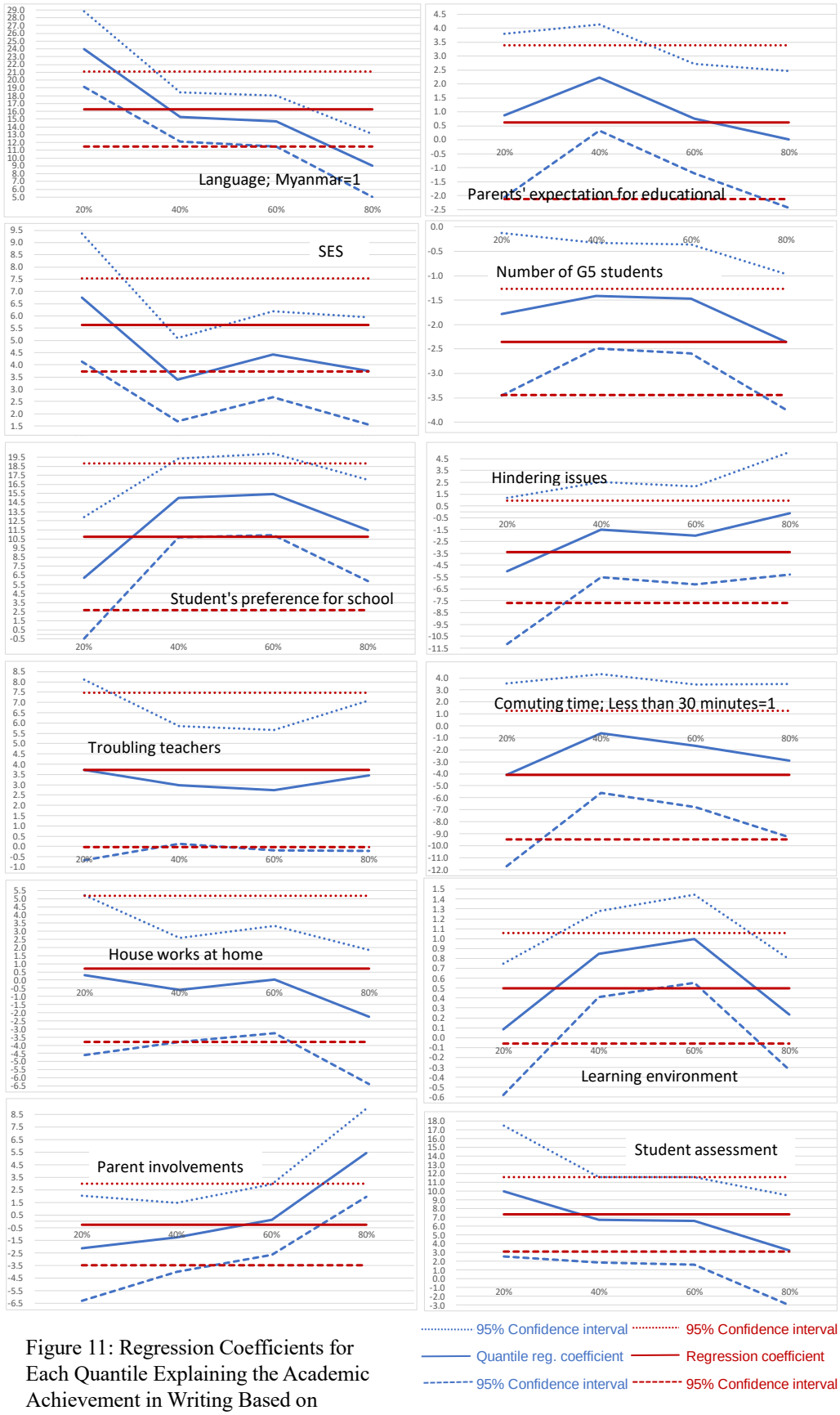



Figure 11: Regression Coefficients for Each Quantile Explaining the Academic Achievement in Writing Based on Teachers as the Measuring Unit

Table 10: Factors Explaining Students' Positive Perception toward School
Based on Teachers as the Measuring Unit

| Preference for school | | Coef. | Std. Err. | t | P>t | Beta | *SE |
|---|---|---|---|---|---|---|---|
| Student survey | Language Myanmar | 0.169 | 0.061 | 2.760 | 0.006 | 0.234 | 0.473 |
| | Math lesson hours | 0.077 | 0.035 | 2.210 | 0.028 | 0.155 | 0.328 |
| | Troubling teachers | 0.150 | 0.047 | 3.210 | 0.001 | 0.258 | 0.155 |
| | House works | -0.141 | 0.051 | -2.780 | 0.006 | -0.174 | 0.045 |
| School/ teacher survey | Commuting time | 0.187 | 0.078 | 2.410 | 0.017 | 0.147 | 0.005 |
| | Classroom management | 0.130 | 0.040 | 3.220 | 0.001 | 0.105 | 0.056 |
| Constant | | 2.854 | 0.150 | 19.040 | 0.000 | | 0.845 |

Number of observation= 375 *SE=calculated using replication method
F (6, 368)= 19.61 Prob>F= 0.000
R-squared= 0.311

teachers as the measuring unit. The results of the analysis were the same as those for the students based analysis. The important factors were fewer problematic teachers, the home language was the Myanmar language, exemption from excessive household workload, proper lesson tome for mathematics study, and the commuting time to school was short. As a result of teacher training, it was noteworthy that the teachers who received training in classroom management had a higher effect.

Thus, similar results can be obtained from both student-based and teacher-based analyses, but the effects of teacher training, for example, were clearly shown in the teacher-based analysis because the information was not yet compressed.

## 6 Measures for Improvement

### 6.1 Measures to Improve Academic Achievement, Narrow the Achievement Gap, and Increase Students' Positive Perception toward School

A major issue is what policies can be taken to improve the academic achievement of students and at the same time reduce the gap among students. From the analyses of student-based and teacher-based data, it was clear that students' positive perception toward school was an important contributing factor to academic achievement, but the question was how to increase students' positive perception toward school through a policy. One hint was the classroom management training programs for teachers as shown in Table 10.

Figure 12 shows the relationship between whether a teacher has received various types of training and the average academic achievement of the school to which the teacher belongs, the standard deviation indicating the variation in academic achievement, and the average level of positive perception of the school by student. The training included questions on how to teach mathematics, how to teach reading, how to teach writing, how to teach social studies, classroom management, student assessment, ICT, teaching methods, inclusive education, and personalized learning. The training experience in these topics was divided into four categories: pre-service, in-service, both, and no experience, to see how the averages of each value differed. The expected results were that the greater the level of experience, the more the training content was thought to have been acquired, and the greater the level of training experience, the higher the academic achievement and the students' positive perception toward school, and the smaller the variation in academic achievement.

From Figure 12, the effects were generally as expected. In other words, as a general trend, teachers who received a lot of training were associated with students' higher academic achievement and positive perception toward school, while those who did not receive any training were associated with students' lower academic achievement. This was especially true for training in classroom management. Even though the content of the various training programs varied, the basic idea of these training programs was to provide appropriate guidance according to each student's situation, and this could be interpreted as the reason for these similar results.

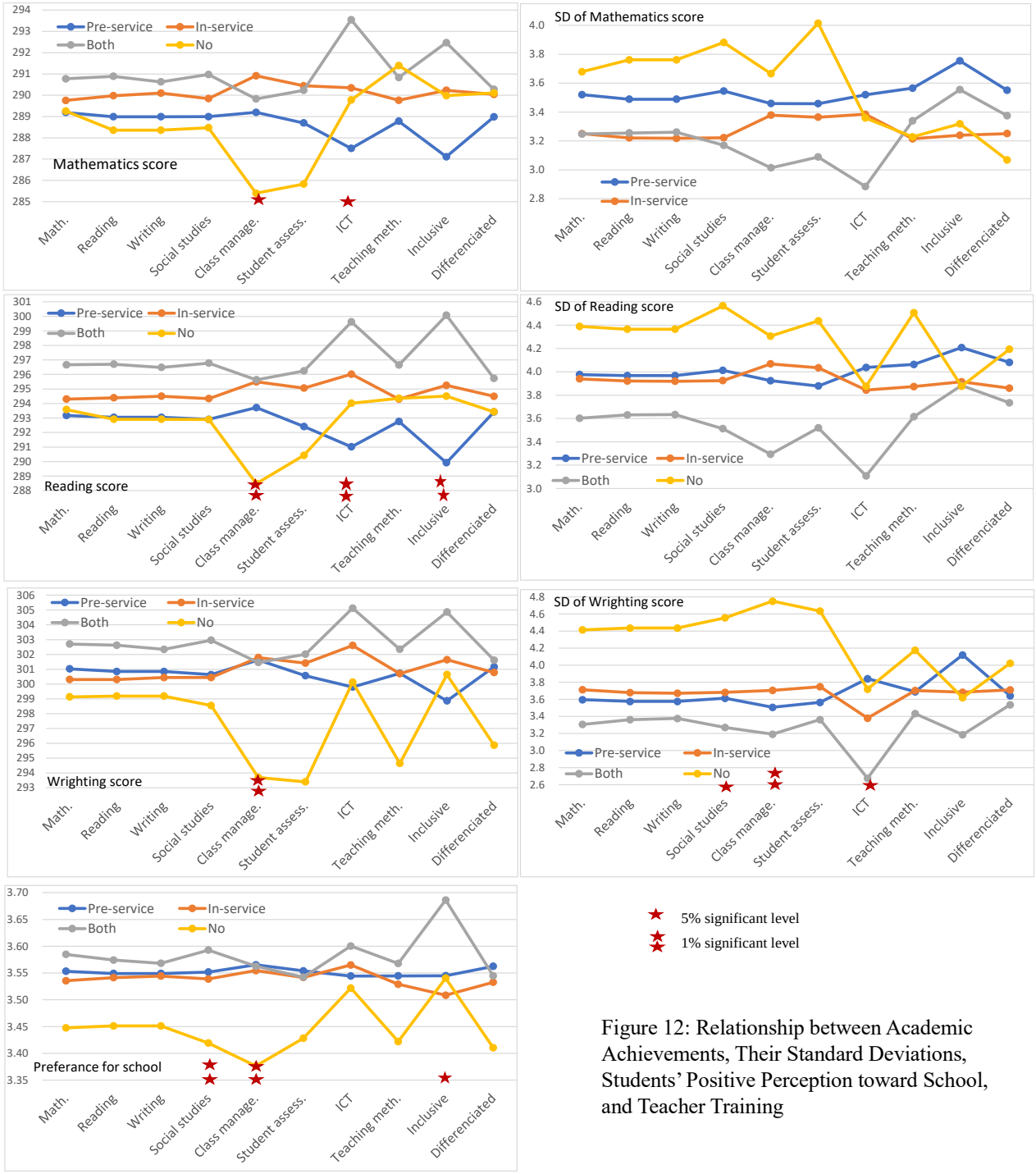



Figure 12: Relationship between Academic Achievements, Their Standard Deviations, Students' Positive Perception toward School, and Teacher Training

### 6.2 Issues on Language of Instruction

Previous analysis has shown that the language of instruction was an important factor in improving academic achievement. In Myanmar, all textbooks used at Basic Education Schools are written in the Myanmar language, except for science and mathematics in the high school course where English is used. At the fifth-grade level, all textbooks are written in the Myanmar language. Although the official language of classroom instruction is the Myanmar language, in remote areas where local language s other than the Myanmar language are the mainstream at home, the majority of teachers may be from the local area, and the majority of students in the class speak the local language. It was not surprising that

the actual language of instruction was the local language, even though textbooks written in the Myanmar language were used.

According to the school survey, out of the 202 schools surveyed, there were 7 schools that reported a language other than the Myanmar language as the teaching language. Some of the students in these 7 schools used the Myanmar language as their home language. Therefore, the students can be divided into the following four language groups.

Group A: The home language is not the Myanmar language and the teaching language is not the Myanmar language. (115 including 40 upper SES.)

Group B: The home language is not the Myanmar language, but the teaching language is the Myanmar language. (1,147 including 457 upper SES.)

Group C: The home language is the Myanmar language and the teaching language is not the Myanmar language. (11 including 1 upper SES.)

Group D: The home language is the Myanmar language and the teaching language is also the Myanmar language. (4,445 including 1,998 upper SES.)

In the case of Group A, most of the students had the same home and teaching language. There may be a few who were different, but detailed data was not available. Strictly speaking, the affinity between the languages must be taken into account for strict discussion, so they are not classified further here. Figure 13 shows whether there is a difference in the average academic achievement in mathematics, reading, and writing among these four groups. The calculation was done with a base weight that took sampling error into account. The 95% confidence intervals for the averages were also shown, so it was easy to understand whether there was a significant difference in the averages between the different groups.

Figure 13 indicates that for all three academic achievement scores, the average scores of students whose home language and teaching language were both the Myanmar language (Group D) were significantly higher than those of the other three groups. This was especially true for the academic achievement in writing.

Concerning the Groups A, B and C, in the academic achievement in mathematics, the average score of Group A decreased by 5.59 points from Group D. Group B was also 4.67 points lower, significantly different from Group A. The average score of Group C was almost the same as that of Group B, but the variance was large, partly due to the small sample size, and there was no significant difference between Group A and Group B. In academic achievement in reading, the scores were higher for Groups A, B, and C, respectively, but they were not high enough to make a significant difference. In academic achievement in writing, the scores were in the order of Groups C, A, and B, but they were not high enough to make a significant difference. However, if the 4 groups were reclassified by home language, such as (A,

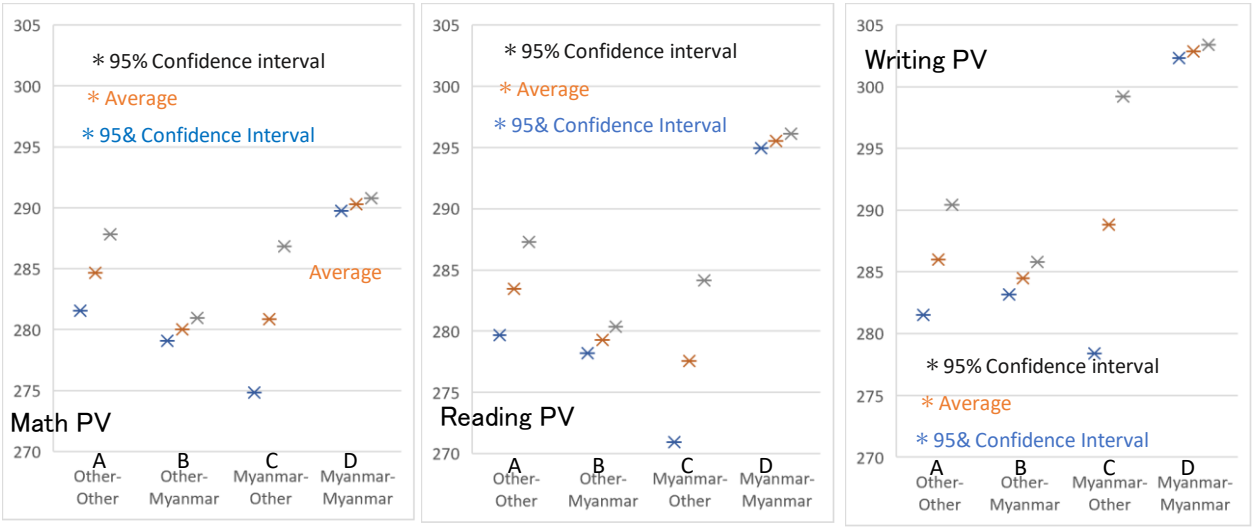



Figure 13: Average Academic Achievement Scores and Their 95% Confidence Intervals in Mathematics, Reading, and Writing by the Four Language Groups

B) and (C, D,) the average scores for all three academic achievements were significantly higher for students whose home language was the Myanmar language.

From the above, it was seen that for students whose home language was not the Myanmar language, the fact that the teaching language was the home language was of great help in subjects where understanding the content was important, such as mathematics proficiency. However, for subjects where the cultural and social background had a strong influence, such as writing proficiency, the influence of the teaching language was considered to be somewhat limited.

From the previous analyses, it was known that SES had a strong influence on academic achievement. Therefore, the above analyses by SES level were conducted. The SES index was standardized to have an average of 0.0 and a variance of 1.0 for the survey targets in Myanmar, so students with the value of 0.0 or higher were categorized in the upper group, and those with the value of less than 0.0 were categorized in the lower group.

Figure 14 shows the results of the analysis of the upper SES group. Group C was not considered since there was only one sample. For mathematics, unlike Figure 13, there was a difference of 6.34 points in the average between Group D and Group A, but the

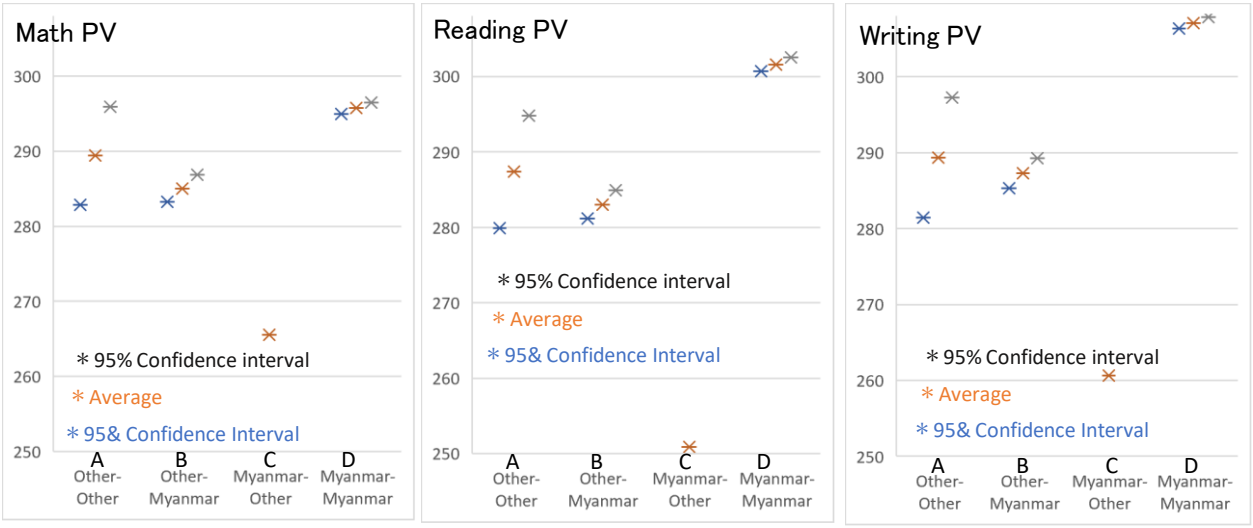



Figure 14: Average Academic Achievement Scores and Their 95% Confidence Intervals in Mathematics, Reading, and Writing by the Four Language Groups in the Upper SES Subgroup

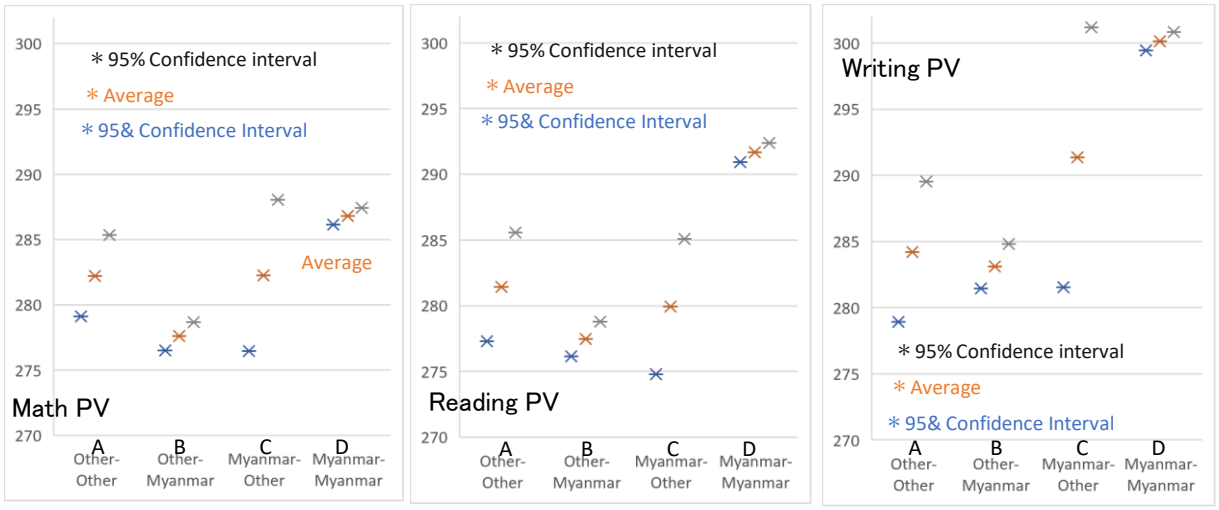



Figure 15: Average Academic Achievement Scores and Their 95% Confidence Intervals in Mathematics, Reading, and Writing by the Four Language Groups in the Lower SES Subgroup

difference was not significant. In addition, between Group A and Group B, the average for Group A was higher, but not significant. In contrast, for the lower SES groups in Figure 15, there were significant differences between Group D and Group A, and between Group A and Group B. This may signify that the group with higher SES had family support to overcome the handicap of the difference between the home language and the language of instruction.

Another point of view is that for the students with lower SES, using home language as the teaching language helped much more in obtaining higher mathematics achievement than for those with higher SES, even if the home language was also a non-Myanmar language. However, for writing proficiency, the influence of the language of instruction was not significant, regardless of the SES level. The same was true for reading proficiency.

## 7 Conclusions and Policy Implications

### 7.1 Summary and Conclusion

According to the Main Regional Report of SEA-PLM2019 [22], the country of Myanmar ranked in the middle when compared to the other five ASEAN countries, despite having the lowest GDP/C, a younger fifth-grade age, and an outdated curriculum. In addition, when compared according to various classification criteria (gender, urban/rural, SES, etc.,) the differences in academic achievements among students were relatively small and equitable among the six ASEAN countries. Of course, although differences by classification criteria were relatively small compared to other countries, it was still important to obtain suggestions for policies to reduce the disparities as well as measures to improve academic achievements in general.

In the distribution of academic achievement scores in mathematics, the 50 percentile, which was the middle in the order of the test takers' achievement, was 288 points, which was below the six ASEAN countries' average of 300 points; in order to get 300 points, the score must be in the 76 percentile, and the score must be in the 88 percentile in order to exceed the Band 6 standard of 308 points, which was the standard value for fifth-grade students. In the distribution of academic achievement scores in reading, the 50 percentile was 291 points, which was below the average of the six ASEAN countries, and the 66 percentile was needed to reach 300 points, while the 89 percentile was needed to exceed the Band 6 standard of 317 points. The distribution of academic achievement scores in writing was 301 points for the 50 percentile, which was almost equal to the average of the six ASEAN countries. Thus among the three academic achievements, mathematics was relatively low. But mathematics is one of the basic academic proficiencies needed in the 21st century.

In considering measures to increase academic achievement, it is important to know what factors can explain the magnitude of academic achievement. Parental SES is usually the most significant explanatory variable in this type of analysis. In the case of SEA-PLM2019, it was also the variable with the highest explanatory power in mathematics and reading, and it also showed reasonable explanatory power in writing.

However, for academic achievement in writing, the fact that the language at home was the Myanmar language was the most significant explanatory variable, second in reading proficiency, and correspondingly significant in mathematics proficiency. For students who did not speak the Myanmar language as their home language, it was a foreign language, and cultural background seemed to be important, especially in learning how to write. It was thought that consideration should be given to the placement of assistant teachers who were fluent in the local home language and the development of supplementary materials.

For all three academic proficiencies, there was a strong tendency that the higher the students' positive perception toward school, the higher their academic achievement. This was a satisfactory result, but there was enough room for improvement through school management and teaching methods. The fact that the smaller the number of problematic teachers, the higher the academic achievement was also related to school management, and it was an issue that can be improved through educational policy. The availability of adequate lesson time, as represented by the number of hours spent in mathematics, the short commute to school, the small size of the fifth grade, and the excellent physical learning environment of the school were also important policy

variables for high academic achievement.

Of course, it was also important for parents to be actively involved in their children's learning, to have high expectations of their children's education, and to avoid excessive household workload. It was possible to increase the impact of these factors through educational activities for parents.

The results according to gender were mixed, with boys tending to have higher proficiency in mathematics, but conversely girls tended to have higher proficiency in writing.

These were general trends, but it is possible that the degree of influence might differ greatly between the higher- and lower-achieving groups depending on the factors. This was confirmed by quantile regression analysis.

From the quantile regression analysis in mathematics based on the students as the measuring unit, the most remarkable change in regression coefficients by quantile was for SES. The regular regression analysis showed that an increase of 1 point in the SES index was expected with an increase of 4.82 points in academic achievement in mathematics. However, from the results of the quantile regression analysis, the effect of SES was larger for the group with higher academic achievement: 4.02 points for a quantile of 10% and 5.72 points for a quantile of 90%. It seemed that in addition to intelligence and student effort, many other resources such as parental cooperation and the home learning environment, were necessary to achieve high academic achievement. In the case of academic achievement in reading, the SES indexes did not differ significantly depending on the quantile as in the case of mathematics. But in the case of academic achievement in writing, the regular regression analysis showed that an increase of 1 point in the SES score was expected to result in an increase of 3.23 points in the writing proficiency score, while an increase of 4.55 points was expected for the quantile of 10%, and 2.42 points for the quantile of 80%. The effect of SES was larger for the lower-achieving groups, contrary to the case in mathematics.

The students' positive perception toward school was an average of 3.53 and a standard deviation of 0.530. In terms of academic achievement in reading, on average, a 1-point increase in positive perception toward school was associated with a 7.78-point increase in reading proficiency, but the effect was greater for students whose academic achievement was midrange, at 9.52 points for the quantile of 50% and 5.21 points for the quantile of 90%. In addition, parents' educational expectations of their children and the school's learning environment were relatively high at the quantile of 90%.

In academic achievement in writing, the most significant difference by quantile was whether or not the home language was the Myanmar language, the language of instruction. According to the regular regression analysis, a 13.92-point increase in writing achievement was expected if the home language was the Myanmar language. However, the quantile regression results showed that the influence of the home language was greater for the lower academic groups: 20.50 points for the quantile of 10% and 7.78 points for the quantile of 90%. This may be because students with higher academic achievement were able to overcome the handicaps of low SES and different languages to some extent. The regression coefficients for gender differences and positive perception toward school also tended to be smaller for the high academic achieving group, but could be interpreted in the same way.

An analysis using teachers as the measuring unit yielded similar results. The effect of whether or not the home language was the Myanmar language had the greatest impact on academic achievement in writing, followed by reading and mathematics. The impact was particularly large among those with lower academic achievement in writing. SES, students' positive attitude toward school, and grade size, as well as whether or not the teacher had received training in student assessment were significant across the three subjects.

From an analysis of the factors explaining students' positive perception toward school based on students as the measuring unit, the most significant explanatory factor was that the home language was the Myanmar language. This was followed by a short commute to school, the appropriate teaching time of mathematics, fewer problematic teachers, and less household workload at home.

In the same analysis based on teachers as the measuring unit, such variables as the absence of problematic teachers, the Myanmar language as the

home language, the less household workloads, the appropriate teaching time of mathematics, and the short commute to school were all important, the same as the analysis results based on students. As a result of teacher training, it was noteworthy that classrooms with teachers who received training in classroom management had a higher effect on the students' positive perception toward school.

### 7.2 Policy Implications

The following policy implications can be derived from the above analyses.

1) Consider assigning assistant teachers who are fluent the local home language and using supplementary materials for students whose home language is not the Myanmar language.

Among the fifth-graders of the primary school course surveyed in this study, 23.81% of them did not speak Myanmar language as their home language. Myanmar language is designated as the official language of instruction [27]. Learning the Myanmar language is necessary not only for understanding subject content, but also for establishing one's identity as a Myanmar citizen. Especially in the lower grades, it is necessary to take measures to ensure that students who do not use the Myanmar language at home are not disadvantaged by using their home language in combination with the Myanmar language or by using supplementary materials and having more language support teachers. It is hoped that these measures will not only improve academic achievement, but also correct the disparity in academic achievement.

2) Try to teach according to academic proficiency of student.

Among the three types of academic proficiencies, it is clear that writing proficiency is the most culturally influenced and mathematics proficiency is the most socioeconomically influenced. While it is of course important to raise the academic achievement of higher-achieving students in order to develop their potential, it is also essential to provide adequate instruction to lower-achieving students in order to guarantee that all students achieve at least the standard academic achievement based on the concept of "no one left behind." Smaller grade sizes are more effective for lower-achieving students in mathematics and reading proficiency. This is probably because careful instruction can be expected.

3) Improve teacher training to increase students' positive perception toward school.

The general trend is that teachers who have received enough training can contribute to higher levels of academic achievement and raise the students' positive perception toward the school, while teachers who have not received any training cannot do so. The deviation in academic achievements is small for teachers, who have received adequate training, and large for those who have not received any training. This is especially true for training in classroom management. Even though the content of the various training programs varies, the basic concept of these programs is to provide appropriate treatment according to the situation of each individual student.

4) Conduct orderly school management.

Fewer problematic teachers and well-organized classes have an impact on both academic achievement and the students' positive perception toward school. Appropriate school management, including ensuring that commuting to school is not very difficult, is fundamental to improving academic achievement.

### Acknowledgments

This study was based on the work of the mission for "Advisor for Educational Policy" in the Republic of the Union of Myanmar funded by JICA (Japan International Cooperation Agency) and it was supported by the Grant-in-Aid for Scientific Research (C) Grant Number 21K02299 for publication. The author owes all the responsibility of the results of the study, and the results were not reflected by the opinion of JICA nor the Government of the Republic of the Union of Myanmar.

### References

[1] Coleman, J. S., Campbell, E. Q., Hobson, C. J., McPartland, J., Mood, A. M., Weinfeld, F. D., & York, R. L. Equality of Educational Opportunities. U.S. Department of Health, Education and Welfare. 1966.

[2] Sirin, S. R. Socioeconomic status and academic

achievement: A meta-analytic review of research. Review of Educational Research. 2005, 75(3), 417-453.
[3] Ciftci, S. K. & Cin, F. M. The effect of socioeconomic status on students' achievement. In: Karadag, E. (eds). The Factors Effecting Student Achievement. Springer, 2017, 171-181.
[4] Luo, L. Socioeconomic status and academic achievement in primary and secondary education: a meta-analytic review. Educational Psychology Review. 2022, 34, 2867-2896.
[5] Perry, L. B., Saatcioglu, A. & Michelson, R. A. Does school SES matter less for high-performing students than for their lower-performing peers? A quantile regression analysis of PISA 2018 Australia. Large-scale Assessments in Education. 2022, 10(17), https://doi.org/10.1186/s40536-022-00137-5, (accessed 2023-10-27).
[6] Michael, D. & Kyriakides, L. Mediating effects of motivation and socioeconomic status on reading achievement; a secondary analysis of PISA 2018. Large-scale Assessment in Education. 2023, 11(31), Springer. https://doi.org/10.1186/s40536-023-00181-9, (accessed 2023-10-27).
[7] Wang, X. S., Perry, L. B., Malpique, A. & Ide, T. Factors predicting mathematics achievement in PISA: a systematic review. Large-scale Assessments in Education. 2023, 11(24), 1-42.
[8] Heyneman, S. P. & Loxley, W. A. The effect of primary school quality on academic achievement across twenty-nine high- and low- income countries. American Journal of Sociology. 1983, 88(6), 1162-1194.
[9] Tomita, M. & Muta, H. The Comparison of the Influence of School Factors and Family-Related Factors on Learning Achievements: Confirmation and Policy Implication of HL Effect in Low-Income Countries from MALP Example in Malawi. Journal of International Cooperation in Education. 2012, 15(1), 23-38.
[10] Tomul, E. & Çelik, K. The relationship between the students' academics achievement and their socioeconomic level: cross regional comparison. Procedia - Social and Behavioral Sciences. 2009, 1(1), 1199-1204.
[11] You, H. S. Do schools make a difference?: Exploring school effects on mathematics achievement in PISA 2012 using Hierarchical Linear Modeling. Journal of Educational Evaluation. 2015, 28(5), 1301-1327.
[12] Tan, C. Y., Dimmock, C. & Walker, A. How school leadership practices relate to student outcomes; Insight from a three-level meta-analysis, Educational Management Administration and Leadership. 2021, 36-54. https://doi.org/10.1177/17411432211061445, (accessed 2023-10-27).
[13] Lopez-Martin, E., Gutierrez-de-Rozas, B., Gonzalez-Benito, A. M. & Exposito-Casas, E. Why do teachers matter? A Meta-analytic review of how teacher characteristics and competencies affect students' academic achievement. International Journal of Educational Research. 2023, 120. https://doi.org/10.1016/j.ijer.2023.102199, (accessed 2023-10-27).
[14] Korpershoek, H., Canrinus, E.T., Fokkens-Bruinsma, M. & de Boer, H. The relationships between school belonging and students' motivational social-emotional. behavioral, and academic outcomes in secondary education: a meta-analytic review, Research Papers in Education. 2020, 35(6), 641-680.
[15] Tao, Y., Meng, Y., Gao, Z. & Yang, X. Perceived teacher support, student engagement, and academic achievement: a meta-analysis. An International Journal of Experimental Educational Psychology. 2022, 42(4), 401-420.
[16] Kocak, O., Goksu, I. & Goktas, Y. The factors affecting academic achievement: a systematic review of meta analyses. International Online Journal of Education and Teaching. 2021, 8(1), 454-484.
[17] The World Bank. Myanmar Early Grade Reading Assessment (EGRA) for the Yangon Region, 2014 Results Report. Report No: ACS13261. 2015.
[18] Muta, H. Study on the Factors Affecting Scholastic Achievement of Grade 5 and Grade 9 in February 2015 - A Case of Chin State-. Unpublished Research Paper, RP20151021. 2015.
[19] Muta, H. Study on the Factors Affecting Scholastic Achievement -A Case of Mandalay Region-. Unpublished Research Paper, RP20160208. 2016.

[20] Muta, H. Study on the factors affecting the scholastic achievement in the Republic of the Union of Myanmar. International Journal of Cultural Studies. 2019, 29, 774-790.
[21] Spink, J. Southeast Asia Primary Learning Metrics (SEA-PLM) Phase II: Field Trial Final Report. 2018.
[22] UNICEF & SEAMEO. SEA-PLM2019 Main Regional Report, Children's Learning in 6 South East Asian Countries. 2020.
[23] OECD. PISA Data Analysis Manual, SPSS, Second Edition. 2009.
[24] Patrinos, H.A. & Angrist N. Global Dataset on Educational Quality, A Review and Update (2000-2017), Policy Research Working Paper 8592, World Bank Group. 2018.
[25] Ministry of Education. National Education Strategic plan (2021-2030) Summary, p6. 2021.
[26] ACER. SEA-PLM 2019 Data User Manual. 2019.
[27] Republic of the Union of Myanmar, State Administration Council. Law Amending the National Education Law, Section 43, Sub-section (b), 29. 2022.

## Appendix 1

### Technical Notes

**1) Plausible Value as an Estimate of Academic Achievement**

From the structure of the disclosed data, it was confirmed that the mathematics, reading, and writing test questions consisted of 54, 51, and 34 items, respectively (60, 51, and 41 sub-questions, respectively,) and each item had a pre-determined difficulty level (what is the probability that a person with a certain academic ability can solve the question). The test characteristics were measured in advance. A total of 18 different test booklets were created by selecting 30 to 38 items from this group of test items, taking into account their test characteristics. These booklets were distributed randomly to students, and students who were seated close to each other were asked to solve different test questions, which was thought to prevent cheating and other forms of inappropriate actions, such as supervisors telling students the correct answers. However, there was no point in simply calculating the number of correct answers for each student when so many students were solving different questions. Since the test characteristics of each test item were known in advance, based on the distribution of the correct answers of each individual, it was possible to calculate the most appropriate level of academic ability for that individual based on the item response theory. This was the estimated Plausible Value of academic achievement for each individual, but since it was an estimated value, it would naturally include errors. Therefore, taking into account the distribution of errors, five different estimates were obtained for each of the three types of academic achievement and for each individual.

**2) Sampling Error**

These students were selected using a two-stage random sampling method: First, a school was randomly selected according to the number of fifth-grade students and regional characteristics. Secondly, one fifth-grade class was selected in that school, and thirdly all students in that class were selected. However, compared to the method of randomly selecting all fifth-graders in the country, the sampling error was larger. For example, if schools in areas where residents with high SES (socioeconomic status) live were selected, the sample size would generally be larger, and the SES of the students would generally be higher and more homogeneous. Therefore, in order to obtain the national average, it was necessary to estimate the national average by assigning large weights to samples with small representativeness and small weights to samples with large representativeness. However, since these weights were also estimate figures, errors would occur. Therefore, in addition to the basic weights, 95 types of weights for recalculation using the jackknife method were prepared in consideration of the distribution of errors. For example, in order to obtain the standard error when estimating the national average value for an individual student's variable, it was necessary to calculate the value using 95 different weights, and then obtained the average value and standard error.

**Appendix 2**

**Table List of Variables Used**

【Scholastic ability】

| | | |
|---|---|---|
| 1 | Plausible value (Mathematics) | ASEAN Average =300, SD=30 |
| 2 | Plausible value (reading) | ASEAN Average =300, SD=30 |
| 3 | Plausible value (Writing) | ASEAN Average =300, SD=30 |

【Student survey】

| | | |
|---|---|---|
| 1 | Age | Age -9 ( - 9.9 years) |
| | | Age 10 ( 10.0 - 10.9 years) |
| | | Age 11 ( 11.0 - 11.9 years) |
| | | Age 12- ( 12.0 years -) |
| 2 | Gender: Dummy variable | 1= Girl |
| | | 0= Boy |
| 3 | Language: Dummy variable | 1= Language at home is the Myanmar language |
| | | 0= Language at home is another language |
| 4 | SES: Social-Economic index | Nationally standardised |
| 5 | Math lesson hours: Average | 1= No time or less than one lesson per week |
| | | 2= One lesson per week |
| | | 3= 2-4 lessons per week |
| | | 4= 5 lessons per week or more |

6 Preference for school: Average from 1 to 5

1 I like being at school.
2 I feel like belong to this school.
3 I have learnt things at school that are useful.
4 I feel safe when I am at school.
5 I make friends easily at school.

1= Strongly disagree
2= Disagree
3= Agree
4= Strongly agree

7 Troubling teachers: Average from 1 to 3

1 My teacher is absent.
2 My teacher has difficulty to get students to quiet down.
3 My teacher comes late for class.

1= Often
2= Sometimes
3= Rarely
4= Never

8 Household workload: Average from 1 to 6

1 House chores (e.g. washing dishes, tidying up, sweeping a floor)
2 Taking care of elderly people
3 Taking care of younger children
4 Farm work (e.g. livestock, fishing, gardening)
5 Commercial activities (e.g.at the market, in a shop, in a restaurant, in the street)
6 Physical work (e.g. in a mine, in a workshop, in a factory)

1= Never or hardly ever
2= Monthly (at least once a month)
3= Weekly (at least once a week)
4= Daily or almost daily

9 Parents' involvement: Average from 1 to 6
1 My parents motivate me to succeed in school.
2 My parents/guardians check if I do my homework.
3 I have to do homework for school.
4 My parents/guardians ask me what I am learning in school.
5 I talk about my schoolwork with my parents.
6 My parents/guardians help me with my homework.

1= Never or hardly ever
2= Monthly (at least once a month)
3= Weekly (at least once a week)
4= Daily or almost daily

10 Commuting time
1= Less than 30 minutes
0= 30 minutes or more

【Parent survey】

1 Capabilities when entrant: Average from 1 to 11
1 Recognize his / her name
2 Recognize colours
3 Count by himself / herself up to 10
4 Read some words
5 Write some words
6 Recognize different shapes (e.g. square, triangle, circle)
7 Write the numbers from 1-20
8 Do simple addition
9 Recognize most of the letters of the alphabet
10 Write letters of the alphabet
11 Write his / her name

1= Yes
0= No

2 Expecting edu. level: Average
1= ISCED level 1
2= ISCED level 2
3= ISCED level 3
4= ISCED level 4 or 5
5= ISCED level 6 or higher

【School survey】

1 Ln (Number of G5 students)

2 Location: Dummy variable
1= A village or rural area
0= A small town, a town, a city, a large city

3 Hindering issues: Average from 1 to 12
1 Offensive behaviours towards students with disabilities
2 Aggression between students due to religious differences
3 Offensive behaviours towards girls
4 Aggression between students from different ethnic group
5 Violence
6 Offensive behaviours towards teachers
7 Bullying
8 Vandalism
9 Cheating
10 Classroom disturbance
11 Truancy
12 Coming late for class

1= Daily or almost daily
2= Weekly (at least once a week)
3= Monthly (at least once a month)
4= Never or hardly ever

【Teacher survey】
1 Learning environment: Average from 1 to 13
1 Teacher desk
2 Class set of textbook
3 Wall chart of any kind
4 Enough desks for all students
5 Dictionary
6 Classroom library, book corner or book box
7 Lockable cabinet
8 Working power outlets
9 Bookshelves
10 Working television / monitor
11 Working computer
12 Interactive whiteboard
13 Working overhead / LCD projector

1= Yes
0= No

2 Training (Classroom management)
1= Yes, during pre-service training,
Yes, during in-service training
Yes, during both pre- and in-service training
0= No

3 Training (Student assessment)
1= Yes, during pre-service training,
Yes, during in-service training
Yes, during both pre- and in-service training
0= No

**Abstract (Japanese)**

2019 年にミャンマー国を含む ASEAN 6 カ国で小学校 5 年生を対象に算数，読解力，書き方の標準学力調査が実施され，2020 年にその結果が公表された．ミャンマー国は調査対象 6 カ国の中で中位の成績を示した．学力を説明する政策的な要因として最も重要なのは教授言語であるミャンマー語と児童が家庭で用いる言語の一致である．家庭の言語がミャンマー語でない場合，特に書き方の学力で明確に低いが，算数でも差が見られる．言語の問題は特に学力の低い層で深刻である．

児童の学校への好感度を高めること，教員の問題行動が少ないこと，授業時間が確保されていること，学校が家庭の近くにあること，学年規模が大きくないこと，物理的学習環境が優れていることなども学力向上に寄与している．子どもの学習に対する親の積極的な関わり，子どもの教育への期待，過度な家事手伝いの免除なども学力向上に効果があり，親への啓蒙活動を通じて改善を図ることができると考えられる．

Key words (Japanese)：学力，SEA-PLM，影響要因，5 年生，国際比較調査

(Received December 1, 2023; accepted April 3, 2024)

**Hiromitsu MUTA, Ph.D.**
Current affiliation:
Senior Chief Researcher, Institute of Human Culture Studies, Otsuma Women's University;
Professor Emeritus, Tokyo Institute of Technology

Profile
Education: Graduate School of Education, The University of Tokyo，Ph.D. (Tokyo Institute of Technology).
Major: Evaluation studies, Comparative and Sociology of Education.

Following studies at the Graduate School of Education, University of Tokyo, the author joined the National Institute for Educational Research, Ministry of Education, as a researcher in 1974, conducting research on educational planning and policy.

After two years of research studies at Stanford University and Harvard University, he joined Tokyo Institute of Technology in 1986. At TIT, he conducted research on education development and ODA evaluation, and worked on numerous development projects and evaluations for the Ministry of Foreign Affairs and the Japan International Cooperation Agency. These included Bangladesh, Cambodia, China, Egypt, Indonesia, Jordan, Kenya, Malawi, Malaysia, Morocco, Nepal, Philippines, Senegal, Sri Lanka, Tanzania, Thailand, Timor-Leste, and Vietnam.

Since retiring from the Tokyo Institute of Technology in 2012, he has worked as a Principal Consultant at the Evaluation Department, International Development Center of Japan, Inc. From 2013 to 2023, he served as a policy advisor to the Ministry of Education of the Republic of the Union of Myanmar as an expert dispatched by JICA, which contributed greatly to the improvement of education policy in Myanmar. Since then, he has continued his research on education in Myanmar.

Experienced positions: Executive Vice President for Finance, TIT; Dean, Graduate School of Decision Science and Technology, TIT; Council member, Graduate School of Decision Science and Technology, TIT; President, Japan Evaluation Society; President, International Development Center of Japan; President, Asian Center of Japan.