



## A COMPARISON OF SCHOOL CLIMATE WITH TIMSS 2015 SCIENCE ACHIEVEMENT AMONG SOUTH-EAST AND EAST ASIAN COUNTRIES

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**Abstract.** *Since 1995, the International Association for the Evaluation of Educational Achievement (IEA) implemented the Trends in International Mathematics and Science Study (TIMSS) as an international comparative study. This article aims at identifying the correlations of science classroom instructions with TIMSS science achievement of eighth graders among countries in Southeast Asia and East Asia. The freely downloadable secondary data were analyzed using a plug-in for SPSS, i.e., the International Database (IDB) Analyzer (version 4.0) of IEA using an imputation methodology involving plausible values so that student's performance can be reported. This study found that Southeast and East Asian countries with high average science achievement adequately emphasized academic success, have teachers with job satisfactions well as facing few challenges, have students with sense of belonging to school. Based on the research findings, policy recommendations were made to the Malaysian Ministry of Education to boost Malaysian eighth graders' science performance in the forthcoming TIMSS studies.*

**Keywords:** *Classroom instructions, comparative study, leadership motivation, science achievement, TIMSS*

### Introduction

School climate not only influences students' academic achievement but is also related to teacher variables such as teacher job satisfaction. According to Dicke et al. (2020), students perceive that there is a relationship between teachers general job satisfaction with the disciplinary climate. However, for both teachers and principals, there is a relationship between teachers' working environment job satisfaction factor with student achievement. Benbenishty et al. (2016) found that school domains of climate, performance and violence are highly connected gradually. Employing a cross lagged research design, Benbenishty et al. (2016) found that greater school performance at the first phase of study led to reduced incidence of school violence as well as greater school climate at the second wave of measurement. The above studies inspired the researchers to conduct a comparative study on school climate and TIMSS 2015 science achievement of eight graders from South-east Asian (including country with high achiever such as Singapore) and East Asian countries (with high achievers such as Japan and Korea).

*Benchmarking Study through Trends in International Mathematics and Science Study (TIMSS)*

The International Association for the Assessment of Educational Achievement (hereafter abbreviated as IEA) was the pioneer for international level of comparative evaluation of educational achievements in the 1960s as an attempt to obtain more in-depth understanding of the impact of educational policies and procedures across various school systems. Trends in International Mathematics and Science Study (hereafter abbreviated



as TIMSS), one of the international comparative assessments, is directed by the International Study Center for TIMSS & PIRLS of IEA at Boston College.

TIMSS seeks to help the participating countries make better decisions on how to improve the teaching and learning of mathematics and science. However, there were also a number of reservations about TIMSS and its underlying political influence and criticisms from academics such as Sjöberg (2015). Since 1995, TIMSS was administered every four years as a regular student assessment program in grades four and eight. The participating countries are provided by TIMSS with much information about trends in the science and mathematics knowledge as well as skills of the students in their respective countries. A diverse range of state-of-the-art assessment is provided in TIMSS on how good students master the essential science and mathematics concepts, content, as well as procedures that countries expect students to learn when they advance through primary and lower secondary level of education. Some of the aforementioned studies were reported by Ong and Gonzalez (2013) as well as Ong et al. (2014).

### *Problem Statement*

Teacher job satisfaction and school climate may have an impact on student's achievement. Dicke et al. (2020) examined data provided by 142,280 teachers and 8,869 school principals from 32 countries that were part of the Teaching and Learning International Survey (TALIS) 2013 – Program for International Student Assessment (PISA) 2012 sample. The climate of school discipline showed the most positive significant relationship with teacher's satisfaction on job, while student achievement was found to be positively related to teachers' ( $r = 0.35$ ) and principals' ( $r = 0.16$ ) satisfaction with the working environment (Dicke et al., 2020). However, Lay and Chandrasegaran (2018) confidence in teaching science and career satisfaction found that Malaysian science teachers' years of experience in teaching, confidence to teach science and satisfaction towards their career did not significantly contribute to eighth grade students' achievement in science. Malaysian eighth grade students were taught by science teachers with more experience who were more confident in science teaching and more satisfied with their teaching career as compared to eighth grade science teachers in Singapore, but these attributes did not translate into higher achievement for the Malaysian students (Lay & Chandrasegaran, 2018) confidence in teaching science and career satisfaction. There is a need to look at the psychological aspect of educators who contribute much towards students' achievement. However, the study by Lay and Chandrasegaran (2018) did not really show teachers' confidence contribute to students' achievement. So, there must be multifaceted factors from the diverse learning culture and environment that affect achievement, hence this study aims to compare these factors in SEAMEO countries and beyond.

Science education, which transcends the pervasive divide between natural sciences and social sciences, is potentially unique in its ability to promote the awareness and participation of new generations as well as to address the social, economic, and environmental aspects of global challenges. Therefore, addressing diversity and equity-related priorities of science education is of vital significance in the light of the global picture of a rapidly evolving world.

Malaysia joined TIMSS studies since 1999 at the eighth-grade level with averagely good mean score from 1999 to 2007, however the country showed deterioration (the country was placed in the bottom third) in performance from 2011 to 2015. Malaysia with a mean score of 492 was ranked 22<sup>nd</sup> place in 1999 among 38 participating countries, 21<sup>st</sup> place in 2003 among 46 countries that participated with an average score of 510, 21<sup>st</sup> place in 2007 among 59 countries that participated with an average score of 471, 32<sup>nd</sup> place in 2011 among 63 participating countries with an average score of 426, and 24<sup>th</sup> place in 2015 among 63 countries that participated with an average score of 471 (Table 1). Hence awareness was raised among academic and researchers in Malaysia on the needs to study the performance of the country in comparison with other higher performed countries as discussed below.

The results of the latest TIMSS 2015 phase indicate that in the fourth and eighth grades, Singapore, Korea, and Japan are the best ranked nations in science and mathematics education. Table 1 shows the TIMSS science scores for Southeast Asian and East Asian Eighth Grade Students from 1995 to 2015.

Therefore, this study is inspired to be conducted to compare the school climate with more in-depth examination of possible underlying factors that may contribute to the excellent performance of students' science achievement in countries like Singapore, Japan, and Korea.



**Table 1***TIMSS (Grade 8) Science Scores for Southeast Asian and East Asian Countries (1995 – 2015)*

Year	No. of countries participated	TIMSS science scores of grade 8 students							Average
		Malaysia	Singapore	Thailand	Japan	Korea	Hong Kong <sup>a</sup>	Chinese Taipei	
1995	45	-	580	-	554	546	510	-	N.A.
1999	38	492	568	482	550	549	530	569	488
2003	46	510	578	-	552	558	556	571	474
2007	59	471	567	471	554	553	530	561	500
2011	63	426	590	451	558	560	535	564	500
2015	63	471	597	456	571	556	546	569	500

## Literature Review

This study is anchored on the leadership motivation theory that focused on modified behavior through reinforcement theory based on Thorndike's Law of Effect as reported by Onjoro et al. (2015). The leadership motivation theory explains well on the important roles of principals and teachers as leaders to motivate students' learning in the school environment that are the aspects emphasized by TIMSS, i.e., school emphasis on academic success, teacher job satisfaction, challenges facing teachers and students' sense of school belonging.

### *School Emphasis on Academic Success*

School climate or learning environment can act as a contributing factor to students' achievement. Benbenishty et al. (2016) states that when school climate and safety are encompassed in systems for accountability, also are valued as important aspects of the functioning of school, these variables may receive more priority from the school leaders and may have a more impact on the school performance academically. Anchored on the leadership motivation theory, the academic success in school is emphasized by teachers, parents, and priority of students as well as ambition for the success academically (Badri, 2019). Measurement was made on the perception of school leaders on teachers, parents, and students in relation to students' performances based on the data from Trends in Mathematics and Science Study (TIMSS) 2015 carried out in the United Arab Emirates. Badri (2019) found that attitudes and behavior of teachers, parents, as well as students were significantly related to students' performance. His study also found that there was a powerful relationship between the expectations of parent as well as students' achievement in education.

Badri (2019) suggests that future research regarding school emphasis on academic success should consider the effect of background, SES reflected by parents' education and other variables such as home resources including number of books available at home, all of which can be obtained from the students' questionnaire in TIMSS. In a study by Badri (2019) parents, and students' priority and ambition for academic success. The school questionnaire items related to school leaders' perception of teachers, parents, and students were used for the analysis (13 items, the school emphasis on academic success as shown by teachers, parents, and priority of students as well as ambition for success academically in the United Arab Emirates was analyzed using the TIMSS 2015 data.

A powerful direct relationship was shown between the type of involvement by parent and achievement academically. The dimension of involvement by parent played a main role, directly and indirectly, in the achievement of student. Teachers show a significant direct influence on students' achievement (Badri, 2019) parents, and students' priority and ambition for academic success. The school questionnaire items related to school leaders' perception of teachers, parents, and students were used for the analysis (13 items. The teacher's role is not limited to providing class instruction to students but also inspiring the students and having high expectations for their achievement as reflected in the analysis involved in school survey items related to perception of school leaders on



teachers, parents, and students (Badri, 2019)parents, and students` priority and ambition for academic success. The school questionnaire items related to school leaders` perception of teachers, parents, and students were used for the analysis (13 items. The findings revealed the significance of attitudes as well as behavior of teachers, students, and parents. There were significant relationships between teachers and students, also between parents with both students as well as scores of TIMSS, also from students to scores of TIMSS (Badri, 2019)parents, and students` priority and ambition for academic success. The school questionnaire items related to school leaders` perception of teachers, parents, and students were used for the analysis (13 items. The study by Conner et al. (2014) also found that the development of scientific literacy, reading and thinking skills during the early years of schooling are among the factors contributing to performance and quality education.

#### *Teacher Job Satisfaction*

Teacher's job satisfaction or sense of achievement towards their career is an important aspect which could have affected their teaching performance and subsequently impacted on students' academic performance. The job satisfaction of teachers can be positive or negatively correlated with many factors. It is found to be positively related to school and personal consonance of value, support from principal, relations with colleagues, relations with parents, as well as sense of belonging (Skaalvik & Skaaliik, 2011). However, Skaalvik and Skaalvik (2011) also found that teacher's job satisfaction was negatively related to pressure regarding time, problems of discipline, exhaustion emotionally, and motivation to leave the teaching job.

Teacher career satisfaction, confidence in teaching science and having more years of experience were linked to Singaporean eighth grade students' higher achievement in science (Lay & Chandrasegaran, 2018)confidence in teaching science and career satisfaction. The study aimed to examine the predictive effects of preparation of teacher (in terms of science teachers' formal education, their majors in science and education, their experience in teaching, their professional development, their preparedness to teach the science topics of TIMSS, their confidence in science teaching, and their satisfaction towards their career) on science achievement among Malaysian and Singaporean eighth grade students who participated in the TIMSS 2011 assessment.

#### *Challenges Facing Teachers*

Teacher's psychological readiness to face the challenges ahead could have contributed to their teaching performance. There are several challenges which teachers have to deal with on a day-to-day basis. These challenges facing science teachers stem from dissimilarity in family support, differential access to resources, as well as sensitivity to the needs of learners who are diverse and their communities (Linn et al., 2016). The increasing diversification of schools' culture, rapid turnover rate of teachers and demands to prepare students dealing with issues globally show challenges that are complex specific to science education (Linn et al., 2016).

Teaching is one of the occupations that is the most stressful. According to Schonert-Reichl (2017), stress in the classroom is contagious: teachers who are stressed-out tend to have students who are stressed-out. It appears that a classroom environment which is without adequate resources has the potential to lead to greater stress levels in a teacher (Milkie & Warner, 2011).

According to Mahmud et al. (2018), teacher education institutions in Malaysia are facing many challenges to prepare science teachers who are skilled to meet current and future challenges in the digital era with increasing needs to incorporating blended learning platforms (Ng & Nyunt, 2010) as well as open and distant education (Gil-Jaurena & Malek, 2013). In addition, Mahmud et al. (2018), Chin et al. (2018), Loganathan et al. (2019), Pang et al. (2019) and Ng et al. (2020) indicated that the challenges facing science teachers in Malaysia are linked to the visible role of science teachers to promote STEM in addition to other challenges faced. These included the English proficiency level necessary to teach dual language programmes (DLP), integrating computational thinking-based science learning in the classroom, promoting higher order thinking skills among students as well as upgrading Information Communication and Technology (ICT) skills.

#### *Students' Sense of School Belonging*

Students' sense of school belonging was deemed a contributing factor to students' academic achievement. Students' sense of school belonging as their confidence to study at school will be enhanced with improved



performance if the school learning environment is good for them e.g., the school is proven to be a safe place to study. According to Lay and Ng (2019), the safety of school as an important learning environment also played a major role in determining students' science achievement. Studies suggest that who students are (i.e., their social identities of race and gender) is related to how they experience STEM and view their current as well as long-term participation in the STEM workforce (Burt et al., 2020). According to Burt et al. (2020) when students do not feel a sense of belonging in STEM, they may not view themselves as future contributors to the STEM workforce. In the study by Rjosk et al. (2017), students in classes with a higher proportion of ethnic minority students showed achievement and feeling of belonging with one's peers that are slightly lower, even if there is student equality in terms of the socioeconomic status, the immigrant background of the family, cognitive ability, and gender. Rjosk et al. (2017) found that there is a positive relationship between the math test scores and a more ethnically diverse classroom environment. However, it could not be interpreted as a causal relationship probably attributed to the cross-sectional design (Rjosk et al., 2017).

### *Research Objectives*

This study embarked on the following objectives:

1. To compare the findings of the TIMSS 2015 pertaining to the science achievement of Grade 8 students among South-east Asian and East Asian countries namely Malaysia, Singapore, and Thailand with reference to:
  - (a) school emphasis on academic success;
  - (b) teacher job satisfaction;
  - (c) challenges facing teachers;
  - (d) students' sense of school belonging.
2. To make policy recommendations to the Ministry of Education to boost science performance of Malaysian Grade 8 students in the forthcoming TIMSS assessments.

## **Research Methodology**

### *General Background*

Data for the study were extracted from the database of TIMSS 2015 (<http://timssandpirls.bc.edu/timss2015/international-database/>). A two-stage stratified sampling approach was implemented in TIMSS. Firstly, sample schools were chosen based on the probability proportional to the school's size. The classrooms inside the chosen schools were then randomly selected. Due to the scheme of sampling of TIMSS, the surveyed samples can represent the whole population in the participating countries. More information concerning data and sampling techniques of TIMSS can be found in the technical reports by Martin et al. (2016). In TIMSS secondary data analysis, responses from the groups of respondents were assigned sampling weights to adjust for over- or under-representation during the sampling of a particular group. The use of sampling weights is necessary for the computation of sound, nationally representative estimates (Martin et al., 2016)

### *Science Achievement*

The TIMSS 2015 scale for science achievement was focused on science subjects like information (Biology, Chemistry, Earth Science, Physics) and cognitive (Knowing, Implementing, Reasoning) domains. To report student results, TIMSS uses a synthetic data approach, which requires plausible values. Realistic values are natural factors from either the set of ratings, consists of a process proposed by Mislevy and Sheehan (1987, 1989) and based on Rubin's (1987) principle of imputation (i.e., draws randomly from the marginal posterior of the latent distribution used as a measure of achievement in science). A plug-in for SPSS, the IEA International Database (IDB) Analyzer for TIMSS, had been used to aggregate the five plausible values and to generate their weighted mean as well as to address standard errors.



## Research Results

### *Emphasis of School on Success Academically (Principals' Reports)*

Table 2 summarizes the descriptive statistics (weighted) with mean scores for the school emphasis on academic success as reported by the principals in Southeast Asian countries. According to the analysis based on principal's reports, Malaysia was the Southeast Asian country with the highest average scale score of emphasis of school on success academically (10.96), followed by Singapore (10.74) and Thailand (10.28).

Malaysia had the highest mean scores for 'expectations of teachers for achievement of student' ( $M = 4.61$ ), 'teachers working together to improve achievement of student' ( $M = 4.54$ ), 'teachers' understanding of the goals of school's curriculum' ( $M = 4.43$ ), 'parental expectations for achievement of student' ( $M = 4.28$ ), 'teachers' ability to inspire students' ( $M = 4.24$ ), and 'teachers' success degree to implement the curriculum of school' ( $M = 4.18$ ).

Singapore had the highest mean score for 'students' respect for classmates who excel in school' (3.99), 'students' desire to do well in school' ( $M = 3.82$ ), 'parental pressure for the school to maintain high standards academically' ( $M = 3.65$ ), and 'commitment of parents to ensure that students are ready to learn' ( $M = 3.41$ ). However, Thailand had the highest mean score for 'parental involvement in school activities' ( $M = 3.40$ ).

**Table 2**

*Descriptive Statistics (Weighted) with Average Scale Scores for Southeast Asian School Emphasis on Academic Success (Principals' Reports)*

Statement code	Statement	Southeast Asian countries					
		Malaysia		Singapore		Thailand	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
School emphasis on academic success (principals' reports)							
BCBG14A	The understanding of teacher for the school's curricular goals	4.43	0.531	4.20	0.532	4.08	0.597
BCBG14B	Teachers' degree of success to implement the school's curriculum	4.18	0.596	3.90	0.596	3.72	0.593
BCBG14C	The expectations of teachers for achievement of student	4.61	0.518	4.07	0.670	4.09	0.651
BCBG14D	Teachers working together to improve achievement of student	4.54	0.532	4.23	0.660	4.05	0.655
BCBG14E	Teachers' ability to inspire students	4.24	0.578	3.77	0.615	3.89	0.629
BCBG14F	Parental involvement in school activities	3.16	0.843	2.95	0.867	3.40	0.897
BCBG14G	The commitment of parent to ensure that students are ready to learn	3.37	0.859	3.41	0.766	3.33	0.932
BCBG14H	Parental expectations for student achievement	4.28	0.770	3.87	0.745	4.10	0.782
BCBG14I	Parental support for student achievement	3.60	0.870	3.51	0.786	3.37	0.847
BCBG14J	The pressure of parent for the school to maintain high standards academically	3.49	0.871	3.65	0.774	3.63	0.876
BCBG14K	The desire of students to do well in school	3.80	0.726	3.82	0.668	3.76	0.748
BCBG14L	The ability of students to reach school's academic goals	3.66	0.687	3.65	0.659	3.55	0.714
BCBG14M	The respect of students for classmates who excel in school	3.88	0.684	3.99	0.618	3.74	0.687
Average scale score		10.96 (0.12)		10.74 (0.00)		10.28 (0.14)	

Note. 1 = Very Low; 5 = Very High; standard errors appear in parentheses.



Table 3 illustrates the descriptive statistics (weighted) with mean scores for the emphasis of school on academic success as reported by the principals in East Asian countries. According to the analysis based on principal's reports, Korea was the East Asian country with the highest average scale score of school emphasis on academic success (11.22), followed by Chinese Taipei (9.98), Japan (9.83), and Hong Kong SAR (9.66).

Korea had the highest mean scores for all the statements in the scale of Emphasis of School on Success Academically except 'pressure of parents for the school to maintain high standards academically' (Chinese Taipei,  $M = 3.41$ ) and 'respect of students for classmates who excel in school' (Hong Kong SAR,  $M = 3.90$ ). Korea had the highest mean scores for 'understanding of teachers on the school's curricular goals' ( $M = 4.48$ ), 'teachers' degree of success to implement the school's curriculum' ( $M = 4.46$ ), 'ability of teachers to inspire students' ( $M = 4.44$ ), 'expectations of teachers for student achievement' ( $M = 4.28$ ), 'teachers working together to improve student achievement' ( $M = 4.28$ ), and 'parental expectations for student achievement' ( $M = 4.17$ ).

**Table 3**

*Descriptive Statistics (Weighted) with Average Scale Scores for East Asian School Emphasis on Academic Success (Principals' Reports)*

Statement code	Statement	East Asian countries							
		Japan		Korea		Hong Kong, SAR		Chinese Taipei	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
School emphasis on academic success (principals' reports)									
BCBG14A	The understanding of teachers on the school's curricular goals	3.76	0.670	4.48	0.653	4.15	0.561	4.11	0.677
BCBG14B	Teachers' degree of success to implement the school's curriculum	3.71	0.633	4.46	0.612	3.83	0.693	3.91	0.686
BCBG14C	The expectations of teachers for student achievement	3.77	0.688	4.28	0.772	3.80	0.800	4.00	0.707
BCBG14D	Teachers working together to improve student achievement	3.70	0.670	4.28	0.658	3.79	0.699	3.65	0.805
BCBG14E	The ability of teachers to inspire students	3.59	0.694	4.44	0.604	3.52	0.648	3.78	0.685
BCBG14F	The involvement of parent in school activities	3.44	0.776	3.64	0.961	2.94	0.802	3.29	0.922
BCBG14G	The commitment of parent to ensure that students are ready to learn	3.30	0.770	3.42	0.992	2.95	0.940	3.01	0.953
BCBG14H	The expectations of parent for student achievement	3.95	0.772	4.17	0.734	3.57	0.882	3.70	0.919
BCBG14I	Parental support for student achievement	3.32	0.786	3.54	0.968	2.89	0.988	3.50	0.859
BCBG14J	The pressure of parent for the school to maintain high standards academically	3.26	0.817	3.30	0.851	3.16	0.837	3.41	0.849
BCBG14K	The desire of students to do well in school	3.68	0.685	3.86	0.774	3.49	0.711	3.50	0.755
BCBG14L	The ability of students to reach school's academic goals	3.30	0.701	3.43	0.824	3.31	0.791	3.36	0.747
BCBG14M	The respect of students for classmates who excel in school	3.46	0.652	3.66	0.737	3.90	0.644	3.77	0.633
Average scale score		9.83 (0.12)		11.22 (0.17)		9.66 (0.14)		9.98 (0.13)	

Note. 1 = Very Low; 5 = Very High; standard errors appear in parentheses.

The analysis results in Table 4 revealed that Korea (16.54%) had the highest percentage of students attended schools with very high emphasis on success academically with a mean science achievement of 566.76. This was followed by Malaysia (10.00%) with an average science achievement of 523.83.



Korea (65.43%) also had the highest percentage of students attended schools with high emphasis on success academically with a mean science achievement of 557.41. This was followed by Malaysia (65.17%) with an average science achievement of 471.21. However, Hong Kong SAR (55.55%) and Chinese Taipei (46.97%) had the highest percentage of students attended schools with medium emphasis on success academically with a mean science achievement of 523.76 and 552.48, respectively.

**Table 4**  
*School Emphasis on Success Academically – Principals' Reports*

Country	Emphasize very much		High emphasis		Medium emphasis		Avg scale score
	% of students	Avg. SA	% of students	Avg. SA	% of students	Avg. SA	
Malaysia	10.00 (2.11)	523.83 (12.14)	65.17 (3.62)	471.21 (5.64)	24.83 (3.86)	448.36 (7.63)	10.96 (0.12)
Singapore	9.71 (0.00)	661.09 (8.73)	64.27 (0.00)	601.20 (4.45)	26.03 (0.00)	561.84 (6.08)	10.74 (0.00)
Thailand	4.57 (1.54)	478.76 (27.04)	61.19 (4.01)	467.22 (5.44)	34.24 (3.83)	432.46 (5.54)	10.28 (0.14)
Japan	2.15 (1.24)	599.42 (23.37)	52.84 (3.95)	580.75 (2.29)	45.01 (4.04)	557.98 (2.63)	9.83 (0.12)
Korea	16.54 (3.53)	566.76 (6.21)	65.43 (4.29)	557.41 (2.68)	18.03 (3.39)	538.78 (3.39)	11.22 (0.17)
Hong Kong, SAR	5.61 (1.25)	586.43 (11.63)	38.84 (3.80)	567.86 (5.60)	55.55 (3.76)	523.76 (5.27)	9.66 (0.14)
Chinese Taipei	6.97 (1.93)	620.71 (7.68)	46.06 (3.77)	579.06 (3.00)	46.97 (3.54)	552.48 (3.44)	9.98 (0.13)
Intern. Avg	7 (0.3)	533 (3.0)	48 (0.6)	499 (1.0)	45 (0.5)	466 (0.9)	

Note. Reported by principals. Standard errors appear in parentheses. Avg. SA = Average Science Achievement

#### *School Emphasis on Academic Success (Teachers' Reports)*

Table 5 summarizes the descriptive statistics (weighted) with mean scores for the school emphasis on success academically as reported by the teachers in Southeast Asian countries. According to the analysis based on teachers' reports, Malaysia was the Southeast Asian country with the highest average scale score of school emphasis on academic success (11.06), followed by Thailand (10.30), and Singapore (10.25).

Malaysia had the highest mean scores for all the statements in the Emphasis of School on Academic Success Scale except 'parental involvement in school activities' in which Thailand had the highest mean score ( $M = 3.33$ ). Malaysia had the highest mean scores for 'expectations of teachers for student achievement' ( $M = 4.62$ ), 'teachers working together to improve achievement of student' ( $M = 4.49$ ), 'parental expectations for student achievement' ( $M = 4.30$ ), 'collaboration between school leadership and teachers to plan instruction' ( $M = 4.29$ ), 'teachers' ability to inspire students' ( $M = 4.25$ ), and 'understanding of teachers on the school's curricular goals' ( $M = 4.19$ ).



**Table 5***Descriptive Statistics (Weighted) with Mean Scores of Scale for Southeast Asian School Emphasis on Academic Success (Teachers' Reports)*

Statement code	Statement	Southeast Asian countries					
		Malaysia		Singapore		Thailand	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
School emphasis on academic success (teachers' reports)							
BTBG06A	The understanding of teachers on the school's curricular goals	4.19	0.585	4.03	0.553	4.05	0.595
BTBG06B	Teachers' degree of success to implement the school's curriculum	4.03	0.566	3.83	0.598	3.75	0.609
BTBG06C	The expectations of teachers for achievement of student	4.62	0.535	4.00	0.605	4.05	0.650
BTBG06D	Teachers working together to improve achievement of student	4.49	0.558	4.06	0.658	4.02	0.594
BTBG06E	The ability of teachers to inspire students	4.25	0.574	3.81	0.613	3.86	0.611
BTBG06F	The involvement of parents in school activities	3.26	0.757	3.09	0.921	3.33	0.849
BTBG06G	The commitment of parents to ensure that students are ready to learn	3.35	0.782	3.18	0.848	3.27	0.868
BTBG06H	The expectations of parents for achievement of student	4.30	0.757	3.67	0.799	3.98	0.784
BTBG06I	Parental support for achievement of student	3.76	0.826	3.26	0.801	3.46	0.871
BTBG06J	The pressure of parents for the school to maintain high academic standards	3.48	0.810	3.46	0.866	3.44	0.832
BTBG06K	The desire of students to do well in school	3.93	0.778	3.55	0.687	3.60	0.718
BTBG06L	The ability of students to reach school's academic goals	3.61	0.723	3.34	0.704	3.38	0.673
BTBG06M	The respect of students for classmates who excel in school	3.68	0.739	3.57	0.699	3.62	0.708
BTBG06O	The collaboration between leadership in school and teachers to plan instruction	4.29	0.637	3.59	0.786	4.04	0.685
Average scale score		11.06 (0.12)		10.25 (0.08)		10.30 (0.12)	

Note. 1 = Very Low, 5 = Very High; standard errors appear in parentheses.

Table 6 illustrates the descriptive statistics (weighted) with average scale scores for the school emphasis on academic success as reported by the teachers in East Asian countries. According to the analysis based on principal's reports, Korea is the East Asian country with the highest average scale score of school emphasis on academic success (11.23), followed by Chinese Taipei (9.91), Japan (9.63), and Hong Kong SAR (9.58).

Korea has the highest mean scores for all the statements in the Emphasis of School on Academic Success scale except 'teachers' degree of success to implement the school's curriculum' (Chinese Taipei,  $M = 4.29$ ). Korea has the highest mean scores for 'understanding of teachers on the school's curricular goals' ( $M = 4.35$ ), 'ability of teachers to inspire students' ( $M = 4.34$ ), 'teachers working together to improve achievement of student' ( $M = 4.25$ ), 'collaboration between leadership in school and teachers to plan instruction' ( $M = 4.05$ ), and 'expectations of teachers for achievement of student' ( $M = 4.03$ ).

**Table 6***Descriptive Statistics (Weighted) with Mean Scores of Scale for East Asian Emphasis of School on Academic Success (Teachers' Reports)*

Statement code	Statement	East Asian countries							
		Japan		Korea		Hong Kong, SAR		Chinese Taipei	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
School emphasis on academic success (teachers' reports)									
BTBG06A	The understanding of teachers on the school's curricular goals	3.62	0.602	4.35	0.630	4.06	0.534	4.23	0.582
BTBG06B	Teachers' degree of success to implement the school's curriculum	3.63	0.624	4.27	0.626	3.83	0.577	4.29	0.674
BTBG06C	The expectations of teachers for student achievement	3.59	0.682	4.03	0.749	3.64	0.661	3.91	0.695
BTBG06D	Teachers working together to improve student achievement	3.88	0.648	4.25	0.718	3.71	0.700	3.71	0.754
BTBG06E	The ability of teachers to inspire students	3.73	0.641	4.34	0.599	3.63	0.649	3.82	0.702
BTBG06F	Parental involvement in school activities	3.30	0.903	3.61	0.908	3.01	0.861	3.19	0.962
BTBG06G	The commitment of parent to ensure that students are ready to learn	3.14	0.825	3.25	0.924	2.95	0.918	2.90	0.925
BTBG06H	Parental expectations for student achievement	3.83	0.789	3.96	0.847	3.53	0.771	3.55	0.887
BTBG06I	Parental support for student achievement	3.23	0.830	3.47	0.926	3.02	0.910	3.42	0.848
BTBG06J	The pressure of parent for the school to maintain high academic standards	3.31	0.814	3.43	0.818	3.11	0.853	3.29	0.877
BTBG06K	The desire of students to do well in school	3.60	0.800	3.92	0.770	3.36	0.717	3.30	0.752
BTBG06L	The ability of students to reach school's academic goals	3.03	0.806	3.49	0.803	3.09	0.736	3.23	0.688
BTBG06M	The respect of students for classmates who excel in school	3.37	0.728	3.91	0.667	3.59	0.726	3.56	0.772
BTBG06O	Collaboration between leadership in school and teachers to plan instruction	3.45	0.818	4.05	0.756	3.53	0.792	3.56	0.888
Average scale score		9.63 (0.12)		11.23 (0.17)		9.58 (0.15)		9.91 (0.14)	

Note. 1 = Very Low, 5 = Very High; standard errors appear in parentheses.

The analysis results in Table 7 revealed that Korea (13.13%) has the highest percentage of students attended schools with very high emphasis on success academically with a mean science achievement of 566.23. This is followed by Malaysia (8.71%) with an average science achievement of 480.53.

Malaysia (67.67%) also has the highest percentage of students attended schools with high emphasis on success academically with a mean science achievement of 474.18. This is followed by Korea (60.70%) with an average science achievement of 557.94. However, Japan (60.13%) and Hong Kong (56.28%) have the highest percentage of students attended schools with medium emphasis on success academically with a mean science achievement of 562.72 and 530.84, respectively.



**Table 7**  
*Emphasis of School on Academic Success – Teachers' Reports*

Country	Very high emphasis		High emphasis		Medium emphasis		Avg scale score
	% of students	Avg. SA	% of students	Avg. SA	% of students	Avg. SA	
Malaysia	8.71 (1.90)	480.53 (16.90)	67.67 (3.29)	474.18 (4.97)	23.62 (3.19)	446.74 (11.19)	11.06 (0.12)
Singapore	3.78 (1.06)	628.90 (18.11)	52.97 (2.74)	620.68 (4.65)	43.26 (2.67)	564.40 (5.69)	10.25 (0.08)
Thailand	3.96 (1.46)	498.28 (29.05)	52.51 (3.67)	462.89 (5.83)	43.53 (3.69)	443.48 (5.97)	10.30 (0.12)
Japan	3.67 (1.29)	579.38 (14.28)	36.20 (3.86)	583.94 (3.16)	60.13 (3.92)	562.72 (2.24)	9.63 (0.12)
Korea	13.13 (2.69)	566.23 (6.11)	60.70 (26.17)	557.94 (2.82)	26.17 (3.50)	544.84 (3.19)	11.23 (0.17)
Hong Kong, SAR	1.62 (1.43)	630.78 (7.67)	42.10 (4.10)	561.58 (5.59)	56.28 (4.26)	530.84 (4.58)	9.58 (0.15)
Chinese Taipei	6.29 (1.78)	599.21 (9.58)	37.71 (3.94)	587.87 (4.12)	55.99 (3.92)	553.74 (2.96)	9.91 (0.14)
Intern. Avg	5 (0.2)	520 (3.5)	46 (0.5)	499 (0.9)	49 (0.5)	471 (0.8)	

Note. Reported by teachers. Standard errors appear in parentheses.

#### Teacher Job Satisfaction

Table 8 illustrates the descriptive statistics (weighted) with mean scores for teacher job satisfaction as reported by teachers in Southeast Asian countries. The analysis of teachers' reports reveals that Thailand is the country with the highest average scale score for teacher job satisfaction (10.73), followed by Malaysia (10.46), and Singapore (9.30).

Thailand has the highest mean scores for 'I am proud of the work I do' ( $M = 3.71$ ), 'I am content with my profession as a teacher' ( $M = 3.69$ ), 'I am going to continue teaching for as long as I can' ( $M = 3.67$ ), 'I am satisfied to be a teacher at this school' ( $M = 3.56$ ); My work inspires me ( $M = 3.54$ ), 'I am satisfied to be a teacher at this school' ( $M = 3.56$ ), and 'my work inspires me' ( $M = 3.54$ ). However, Malaysia has the highest mean scores for 'I find my job full of meaning and purpose' ( $M = 3.60$ ) and 'I am enthusiastic about my work' ( $M = 3.59$ ).

**Table 8**  
*Descriptive Statistics (Weighted) with Mean Scores of Scale for Southeast Asian Teachers' Job Satisfaction (Teachers' Reports)*

Statement code	Statement	Southeast Asian countries					
		Malaysia		Singapore		Thailand	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Teacher job satisfaction (teachers' reports)							
BTBG10A	I am content with my career as a teacher	3.53	0.602	3.21	0.696	3.69	0.531
BTBG10B	I am satisfied to be a teacher at this school	3.35	0.644	3.05	0.750	3.56	0.638
BTBG10C	I find my job full of meaning and purpose	3.60	0.564	3.24	0.650	3.53	0.598
BTBG10D	I am enthusiastic about my work	3.59	0.548	3.20	0.692	3.54	0.558

Statement code	Statement	Southeast Asian countries					
		Malaysia		Singapore		Thailand	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
BTBG10E	My job inspires me	3.51	0.603	3.12	0.730	3.54	0.603
BTBG10F	I am proud of the job I do	3.65	0.551	3.25	0.679	3.71	0.524
BTBG10G	I am going to continue teaching for as long as I can	3.65	0.562	3.09	0.774	3.67	0.616
Average scale score		10.46 (0.15)		9.30 (0.13)		10.73 (0.15)	

Note. 1 = Never or Almost Never, 4 = Very Often; standard errors appear in parentheses.

Table 9 summarizes the descriptive statistics (weighted) with mean scores for teacher job satisfaction as reported by teachers in East Asian countries. The analysis of teachers' reports reveals that Chinese Taipei is the country with the highest average scale score of teacher job satisfaction (9.61), followed by Korea (9.50), Hong Kong SAR (9.15), and Japan (8.71).

Chinese Taipei has the highest mean scores for 'I am content with my career as a teacher' ( $M = 3.38$ ); 'I am proud of the job I do' ( $M = 3.32$ ), 'I find my job full of meaning and purpose' ( $M = 3.26$ ), and 'I am satisfied to be a teacher at this school' ( $M = 3.13$ ). Korea has the highest mean scores for 'I am enthusiastic about my work' ( $M = 3.36$ ), 'I am going to continue for as long as I can' ( $M = 3.32$ ), and 'my work inspires me' ( $M = 3.26$ ).

**Table 9**

*Descriptive Statistics (Weighted) with Average Scale Scores for East Asian Teachers' Job Satisfaction (Teachers' Reports)*

Statement code	Statement	East Asian countries							
		Japan		Korea		Hong Kong, SAR		Chinese Taipei	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Teacher job satisfaction (teachers' reports)									
BTBG10A	I am content with my career as a teacher	2.92	0.790	3.14	0.707	3.16	0.733	3.38	0.730
BTBG10B	I am satisfied to be a teacher at this school	2.91	0.819	3.05	0.827	2.94	0.820	3.13	0.834
BTBG10C	I find my job full of meaning and purpose	3.07	0.731	3.19	0.721	3.13	0.748	3.26	0.760
BTBG10D	I am enthusiastic about my work	2.97	0.727	3.36	0.642	3.26	0.709	3.25	0.751
BTBG10E	My job inspires me	2.91	0.755	3.26	0.695	3.01	0.757	3.12	0.851
BTBG10F	I am proud of the job I do	3.09	0.768	3.28	0.689	3.01	0.845	3.32	0.755
BTBG10G	I am going to continue teaching for as long as I can	3.09	0.813	3.32	0.667	3.27	0.721	3.25	0.822
Average scale score		8.71 (0.14)		9.50 (0.14)		9.15 (0.18)		9.61 (0.17)	

Note. 1 = Never or Almost Never, 4 = Very Often; standard errors appear in parentheses.

The analysis of teachers' reports in Table 10 reveals that Thailand (64.54%) has the highest percentage of students whose teachers were very satisfied with an average science achievement of 461.23. This is followed by Malaysia (60.71%) with an average science achievement of 465.02. Japan (60.93%) has the highest percentage of students whose teachers were satisfied with an average science achievement of 570.49. This is followed by Singapore (54.02%) with an average science achievement of 593.98. On the contrary, Japan (19.57%) and Hong Kong SAR (18.51%) have the highest percentage of students whose teachers were less than satisfied with average science achievement of 563.32 and 523.49, respectively.



**Table 10**  
*Teacher Job Satisfaction – Teachers' Reports*

Country	Very satisfied		Satisfied		Less than satisfied		Avg scale score
	% of students	Avg. SA	% of students	Avg. SA	% of students	Avg. SA	
Malaysia	60.71 (3.98)	465.02 (5.90)	36.68 (3.95)	473.12 (7.61)	2.62 (1.15)	449.24 (39.11)	10.46 (0.15)
Singapore	32.72 (2.89)	603.72 (6.62)	54.02 (3.01)	593.98 (5.67)	13.27 (1.84)	590.05 (11.56)	9.30 (0.13)
Thailand	64.54 (4.08)	461.23 (5.22)	31.96 (3.83)	447.45 (6.81)	3.49 (1.43)	443.31 (21.91)	10.73 (0.15)
Japan	19.49 (2.96)	580.15 (3.83)	60.93 (3.84)	570.49 (2.28)	19.57 (3.02)	563.32 (3.65)	8.71 (0.14)
Korea	38.77 (3.56)	556.91 (3.05)	49.44 (3.94)	554.77 (2.96)	11.79 (2.41)	554.77 (7.32)	9.50 (0.14)
Hong Kong, SAR	33.89 (4.09)	562.02 (7.12)	47.60 (5.05)	540.92 (5.44)	18.51 (3.72)	523.49 (9.98)	9.15 (0.18)
Chinese Taipei	42.12 (3.50)	575.33 (3.55)	42.92 (3.39)	564.74 (3.58)	14.96 (2.46)	563.91 (7.14)	9.61 (0.17)
Intern. Avg	49 (.5)	492 (0.8)	42 (0.5)	483 (1.0)	9 (0.3)	478 (2.2)	

Note. Reported by teachers. Standard errors appear in parentheses.

### Challenges Facing Teachers

Table 11 summarizes the descriptive statistics (weighted) with mean scores for challenges facing teachers as reported by the teachers in Southeast Asian countries. The analysis reveals that Malaysia is the country with the lowest average scale score for challenges facing teachers (9.57), followed by Thailand (9.67) (lower average scale score indicates more challenges facing teachers). Challenges facing Malaysian teachers were: 'I need more time to help individual students' ( $M = 1.63$ ), 'there are too many students in the classes' ( $M = 2.03$ ), 'I have too many tasks on administration' ( $M = 2.23$ ), 'I have too many teaching hours' ( $M = 2.43$ ), 'I have difficulty to keep up with all the changes to the curriculum' ( $M = 2.54$ ), and 'I feel too much parental pressure' ( $M = 2.96$ ). On the contrary, Thai teachers were facing challenges in terms of 'I need more time to help individual students' ( $M = 1.63$ ), 'I need more time to prepare for class' ( $M = 1.90$ ), and 'I have too many materials to cover in class' ( $M = 1.96$ ).

**Table 11**  
*Descriptive Statistics (Weighted) with Mean Scores of Scale for Challenges Facing Teachers in Southeast Asian (Teachers' Reports)*

Statement code	Statement	Southeast Asian countries					
		Malaysia		Singapore		Thailand	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Challenges facing teachers (teachers' reports)							
BTBG11A	There are too many students in the classes	2.03	0.919	-	-	2.24	1.105
BTBG11B	I have too many materials to be covered in class	2.42	0.617	-	-	1.96	0.858
BTBG11C	I have too many hours for teaching	2.43	0.740	-	-	2.56	0.844

Statement code	Statement	Southeast Asian countries					
		Malaysia		Singapore		Thailand	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
BTBG11D	I need more time preparing for class	1.95	0.707	-	-	1.90	0.766
BTBG11E	I need more time for assisting individual students	1.63	0.627	-	-	1.63	0.658
BTBG11F	I feel too much pressure from parents	2.96	0.619	-	-	2.97	0.817
BTBG11G	I feel difficult to keep up with all the changes made in the curriculum	2.54	0.776	-	-	2.72	0.932
BTBG11H	I have too many administrative tasks	2.23	0.796	-	-	2.46	0.926
Average scale score		9.57 (0.10)		-		9.67 (0.16)	

Note. 1 = Agree a lot, 4 = Disagree a lot [lower average scale score indicates more challenges facing teachers]; standard errors appear in parentheses; -comparable data not available

Table 12 shows the descriptive statistics (weighted) with mean scores for challenges facing teachers as reported by the teachers in East Asian countries. The analysis of teachers' reports reveals that Korea (8.47) has the lowest average scale score for challenges facing teachers, followed by Hong Kong (9.52), Japan (9.95), and Chinese Taipei (10.60) (lower average scale score indicates more challenges facing teachers).

Korean teachers were facing challenges in terms of 'I have too many administrative tasks' ( $M = 1.72$ ), 'I need more time preparing for class' ( $M = 1.77$ ), 'I have too many materials to be covered in class' ( $M = 1.83$ ), 'there are too many students in the classes' ( $M = 1.86$ ), 'I have too many hours for teaching' ( $M = 1.96$ ), 'I feel difficult to keep up with all the changes made in the curriculum' ( $M = 2.44$ ), and 'I feel too much pressure from parents' ( $M = 2.76$ ). Challenge facing teachers in Hong Kong SAR was 'I need more time for assisting individual students' ( $M = 1.52$ ).

**Table 12**

*Descriptive Statistics (Weighted) with Mean Scores for Scale for Challenges Facing Teachers in East Asian (Teachers' Reports)*

Statement code	Statement	East Asian countries							
		Japan		Korea		Hong Kong, SAR		Chinese Taipei	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Challenges facing teachers (teachers' reports)									
BTBG11A	There are too many students in the classes	2.16	0.911	1.86	0.722	2.13	0.859	2.36	0.873
BTBG11B	I have too many materials to be covered in class	2.66	0.758	1.83	0.733	2.06	0.758	2.13	0.830
BTBG11C	I have too many hours for teaching	2.66	0.822	1.96	0.801	2.90	0.877	2.63	0.919
BTBG11D	I need more time preparing for class	1.90	0.739	1.77	0.638	1.79	0.708	2.34	0.861
BTBG11E	I need more time assisting individual students	1.69	0.609	1.63	0.595	1.52	0.629	1.77	0.693
BTBG11F	I feel too much parental pressure	3.08	0.725	2.76	0.653	2.78	0.654	2.83	0.832
BTBG11G	I feel difficult to keep up with all the changes made in the curriculum	2.89	0.690	2.44	0.780	2.83	0.713	3.27	0.631
BTBG11H	I have too many tasks for administration	2.11	0.829	1.72	0.645	2.12	0.851	3.00	0.908
Average scale score		9.95 (0.12)		8.47 (0.13)		9.52 (0.13)		10.60 (0.15)	

Note. 1 = Agree a lot, 4 = Disagree a lot [lower average scale score indicates more challenges facing teachers]; standard errors appear in parentheses.



The analysis of reports from teachers revealed that Chinese Taipei has the highest percentage of students whose teachers were facing few challenges with an average science achievement of 564.32. This is followed by Japan (47.78%) with an average science achievement of 574.29. Malaysia (66.10) has the highest percentage of students whose teachers were facing some challenges with an average science achievement of 466.50. This is followed by Korea (60.44%) with an average science achievement of 555.78. Korea (22.87%) also has the highest percentage of students whose teachers were facing many challenges with an average science achievement of 559.76.

**Table 13**  
*Challenges Facing Teachers – Reports from Teachers*

Country	Few challenges		Some challenges		Many challenges		Avg scale score
	% of students	Avg. SA	% of students	Avg. SA	% of students	Avg. SA	
Malaysia	32.03 (3.62)	470.42 (8.73)	66.10 (3.75)	466.50 (5.44)	1.87 (0.98)	533.77 (5.78)	9.57 (0.10)
Singapore	-	-	-	-	-	-	-
Thailand	34.66 (3.71)	463.40 (7.92)	60.30 (3.99)	450.39 (5.31)	5.04 (1.73)	469.10 (17.77)	9.67 (0.16)
Japan	47.78 (3.75)	574.29 (2.48)	47.00 (3.98)	566.19 (2.80)	5.23 (1.92)	584.50 (15.38)	9.95 (0.12)
Korea	16.69 (2.45)	549.23 (5.05)	60.44 (3.39)	555.78 (2.47)	22.87 (3.38)	559.76 (5.38)	8.47 (0.13)
Hong Kong, SAR	35.58 (3.87)	534.72 (9.16)	59.31 (4.18)	551.36 (4.54)	5.11 (1.96)	545.83 (12.34)	9.52 (0.13)
Chinese Taipei	61.33 (3.81)	564.32 (3.36)	38.01 (3.75)	577.49 (4.49)	0.65 (0.65)	586.85 (7.30)	10.60 (0.15)
Intern. Avg	45 (0.5)	487 (1.0)	49 (0.5)	481 (0.9)	6 (0.3)	473 (2.7)	

Note. Reported by teachers. Standard errors appear in parentheses.

#### Students' Sense of School Belonging

Table 14 illustrates the descriptive statistics (weighted) with mean scores for students' sense of belonging for school as reported by students in the Southeast Asian countries. The analysis of students' sense of belonging for school reveals that Thailand is the country with the highest average scale score for students' sense of school belonging (10.63), followed by Malaysia (10.10), and Singapore (9.81).

Thailand has the highest mean scores for all the statements in the Students' Sense of Belonging for School Scale: 'I like to see my classmates at school' ( $M = 3.70$ ), 'I am proud to go to this school' (3.69), 'I learn a lot in school' ( $M = 3.64$ ), 'I like to be in school' ( $M = 3.39$ ), 'I feel safe when I am at school' and 'I feel like I am belonged to this school' ( $M = 3.37$ ), and 'teachers at my school are fair to me' ( $M = 3.35$ ).



**Table 14***Descriptive Statistics (Weighted) with Mean Scores Scale for Southeast Asian Students' Sense of Belonging for School (Reports from Students)*

Coding statement	Statement	Southeast Asian countries					
		Malaysia		Singapore		Thailand	
		M	SD	M	SD	M	SD
Students' sense of belonging for school (reports from students)							
BSBG15A	I like to be in school	3.36	0.610	3.17	0.736	3.39	0.626
BSBG15B	I feel safe when I am at school	3.26	0.672	3.25	0.746	3.37	0.654
BSBG15C	I feel like I belong to this school	3.13	0.715	3.08	0.814	3.37	0.693
BSBG15D	I like to see my classmates at school	3.69	0.570	3.48	0.698	3.70	0.587
BSBG15E	Teachers at my school are fair to me	3.33	0.688	3.17	0.757	3.35	0.705
BSBG15F	I am proud to go to this school	3.50	0.636	3.16	0.806	3.69	0.553
BSBG15G	I learn a lot in school	3.63	0.581	3.44	0.652	3.64	0.557
Average scale score		10.10 (0.05)		9.81 (0.03)		10.63 (0.05)	

Note. 1 = Disagree a lot, 4 = Agree a lot; standard errors appear in parentheses.

Table 15 shows the descriptive statistics (weighted) with mean scores for students' sense of school belonging as reported by the students in the countries of East Asia. The analysis revealed that Hong Kong SAR has the highest average scale score for students' sense of school belonging (9.43), followed by Japan and Korea (9.36), and Chinese Taipei (9.35).

Chinese Taipei has the highest mean scores for 'I like to see my classmates at school' ( $M = 3.47$ ), 'I learn a lot' (3.40), 'I feel like I belong to this school' ( $M = 3.39$ ), and 'teachers at my school are fair to me' ( $M = 3.14$ ). Hong Kong SAR has the highest mean scores for 'I feel safe when I am at school' ( $M = 3.07$ ) and 'I am proud to go to this school' ( $M = 2.95$ ). Japan has the highest mean score for 'I like to be in school' ( $M = 3.13$ ).

**Table 15***Descriptive Statistics (Weighted) with Mean Scores of Scale for East Asian Students' Sense of Belonging to School (Reports from Students)*

Statement code	Statement	East Asian countries							
		Japan		Korea		Hong Kong, SAR		Chinese Taipei	
		M	SD	M	SD	M	SD	M	SD
Students' sense of belonging to school (reports from students)									
BSBG15A	I like to be in school	3.13	0.777	3.09	0.666	3.04	0.776	2.88	0.779
BSBG15B	I feel safe when I am at school	3.04	0.795	3.01	0.670	3.07	0.855	2.99	0.768
BSBG15C	I feel like I belong to this school	3.16	0.725	3.32	0.572	2.94	0.875	3.39	0.688
BSBG15D	I like to see my classmates at school	3.41	0.716	3.36	0.615	3.44	0.737	3.47	0.670
BSBG15E	Teachers at my school are fair to me	2.94	0.817	3.13	0.702	3.12	0.845	3.14	0.808
BSBG15F	I am proud to go to this school	2.83	0.853	2.93	0.719	2.95	0.876	2.92	0.808



Statement code	Statement	East Asian countries							
		Japan		Korea		Hong Kong, SAR		Chinese Taipei	
		M	SD	M	SD	M	SD	M	SD
BSBG15G	I learn a lot in school	3.29	0.676	3.17	0.617	3.30	0.728	3.40	0.666
	Average scale score	9.36 (0.05)		9.36 (0.04)		9.43 (0.07)		9.35 (0.04)	

Note. 1 = Disagree a lot; 4 = Agree a lot; standard errors appear in parentheses.

The analysis of students' sense of belonging to school reveals that Thailand (57.77%) has the highest percentage of students with a high sense of belonging to school with a mean science achievement of 455.97. This is followed by Malaysia (45.88%) with an average science achievement of 481.75.

Korea (69.04%) has the highest percentage of students with a sense of belonging to school with an average science achievement of 555.32, followed by Chinese Taipei (63.12%) with a mean science achievement of 567.31. On the contrary, Hong Kong SAR (14.22%) has the highest percentage of students with little sense of belonging to school with a mean science achievement of 524.99, followed by Japan (12.75%) with an average science achievement of 558.25.

**Table 16**  
*Students' Sense of Belonging to School – Reports from Students*

Country	High sense of belonging to school		Sense of school belonging		Little sense of belonging to school		Avg scale score
	% of students	Avg. SA	% of students	Avg. SA	% of students	Avg. SA	
Malaysia	45.88 (1.27)	481.75 (4.27)	50.16 (1.10)	468.33 (4.54)	3.96 (0.51)	384.25 (12.09)	10.10 (0.05)
Singapore	36.64 (0.70)	613.62 (3.21)	54.64 (0.70)	590.52 (3.50)	8.72 (0.43)	564.01 (6.37)	9.81 (0.03)
Thailand	57.77 (1.24)	455.97 (4.16)	40.18 (1.21)	457.69 (5.07)	2.05 (0.20)	427.55 (10.31)	10.63 (0.05)
Japan	27.21 (1.06)	578.83 (2.90)	60.04 (0.89)	570.16 (1.79)	12.75 (0.67)	558.25 (4.27)	9.36 (0.05)
Korea	23.81 (0.93)	565.45 (3.58)	69.04 (0.77)	555.32 (2.12)	7.15 (0.53)	526.00 (5.29)	9.36 (0.04)
Hong Kong, SAR	30.54 (1.56)	562.49 (4.44)	55.24 (1.28)	542.22 (3.76)	14.22 (0.82)	524.99 (6.44)	9.43 (0.07)
Chinese Taipei	26.96 (0.87)	584.21 (2.98)	63.12 (0.74)	567.31 (2.05)	9.92 (0.50)	544.69 (5.09)	9.35 (0.04)
Intern. Avg	44 (0.2)	498 (0.6)	47 (0.2)	483 (0.6)	9 (0.1)	459 (1.1)	

Note. Reported by students. Standard errors appear in parentheses.

## Discussion

The research findings which corroborate with work of others could contribute suggestions of policy recommendations to the Malaysian Ministry of Education (MoE) to boost Grade 8 students' science performance in the forthcoming TIMSS assessments.



Based on the principals' and teachers' reports, Malaysia (10.96, 11.06) has the highest average scale scores for school emphasis on academic success as compared to other TIMSS top performing countries in Southeast Asia (Singapore, 10.74, 10.25) and East Asian countries (Hong Kong SAR, 9.66, 9.58; Japan, 9.83, 9.63; and Chinese Taipei, 9.98, 9.91) except Korea (11.22, 11.23). Even though school emphasis on academic success was given adequate attention in the Malaysian school contexts as there are leadership training centers such as the National Institute of Educational Management and Leadership or *Institut Aminuddin Baki* (IAB) (Ng, 2018), the emphasis was not successfully translated into students' science achievement in TIMSS, as expected. However, it is noteworthy that schools in East Asian countries with high students' average science achievement adequately emphasized academic success.

Malaysia (10.46) has the second highest average scale score for teacher job satisfaction in Southeast Asia as compared to other TIMSS top performing countries in Southeast Asia (Singapore, 9.30) and East Asian countries (Japan, 8.71; Hong Kong SAR, 9.15; Korea, 9.50; Chinese Taipei, 9.61). Malaysia (60.71%) has the second highest students' percentage and these students' teachers were very satisfied with their teaching jobs. However, teacher job satisfaction alone is not a sole determining factor that contributes to students' science achievement in TIMSS as revealed by Lay and Chandrasegaran (2018) confidence in teaching science and career satisfaction that Malaysian science teachers' years of experience in teaching, confidence to teach science, and satisfaction towards their career did not significantly contribute to eighth grade students' achievement in science.

Malaysia (9.57) has the third highest average scale score for challenges facing teachers as compared to other Southeast Asian (Thailand, 9.67) and East Asian countries (Korea, 8.47; Hong Kong SAR, 9.52; Japan, 9.95; and Chinese Taipei, 10.60). Malaysia (66.10) has the highest percentage of students whose teachers were facing some challenges. It is noteworthy that East Asian countries (Korea, Japan, and Chinese Taipei) with high percentages of students whose teachers were facing few/some challenges scored higher in TIMSS assessment. Hence, efforts still need to be devoted continuously as stated in the Malaysia Education Blueprint 2013-2025 (Ministry of Education Malaysia, n.d.) to tackle the challenges faced by Malaysian teachers with more in-service trainings provided by regional training centers such as SEAMEO RECSAM if elevating students' science achievement in the forthcoming TIMSS assessment is of paramount importance.

Malaysia (10.10) has the second highest average scale score for students' sense of belonging to school as compared to other TIMSS top performing country in Southeast Asia (Singapore, 9.81) and East Asian countries (Chinese Taipei, 9.35; Japan, 9.36; Korea, 9.36, Hong Kong SAR, 9.43). Malaysia (45.88%) has the second highest percentage of students with high sense of belonging to school with a mean science achievement of 481.75. It is noticeable that East Asian countries (Chinese Taipei and Korea) with high percentages of students with sense of belonging to school scored higher in TIMSS assessment. Hence, students' sense of school belonging could be one of the contributing factors to students' achievement in TIMSS science subject. Perhaps, some kinds of regional exchange programs or activities that include motivational camp or courses could be conducted to enhance students' sense of school belongings through learning from their peers in SEAMEO countries as reported by Ng et al. (2020).

## Conclusions and Implications

### *Summary and Implications*

This research provides a comprehensive overview on the correlates of school climate with science achievement in TIMSS, not only on the common features related to school climate (i.e., the emphasis of school on success academically as well as challenges facing teachers) but also related to psycho-sociological factors (e.g., teaching job satisfaction, students' sense of school belonging) that affect eighth graders' science achievement in TIMSS. In addition, with comparison made not only among three Southeast Asian countries but also with four East Asian countries (out of which including countries with top achievement in TIMSS), better interpretation of data can be made with conclusion drawn though not explicitly stated. It is expected that this study could make significant contribution with suggestions of policy recommendations to the Ministry of Education (MoE) to boost Malaysian Grade 8 students' science performance in the forthcoming TIMSS assessments.

### *Limitations and Future Direction*

This research only reports cross-sectional study from secondary data without any empirical data from interview or observation of practice due to constraints faced in terms of time and resources. The following are discussions on future direction with suggestions for policy implementations for MoE in Malaysia.



1. Teacher exchange programs among Southeast Asian countries should be considered as:
  - (a) Thai teachers had shown good exemplary practices in terms of teachers' level of motivation and job satisfaction.
  - (b) Singaporean teachers had shown exemplary practices to motivate self-directed learners to excel in TIMSS.
2. Perhaps, online sharing of resources and exemplary practices could be conducted since in the new normal, many educators become ICT literate with skills to participate in e-learning programs. Similarly, efforts should be made to motivate students' science learning, perhaps to include technology-enhanced learning.
3. Even though Malaysia has the highest average scale score for school emphasis on academic success among Southeast Asian countries, but its score was still below Korea when comparison was made with East Asian countries. The same goes to 'challenges facing teachers' in which Malaysia's average scale score was still below Chinese Taipei and Japan. Perhaps, some sharing of exemplary practices or observation should also be made on teachers, principals, or exemplary classroom practices in Korea, Chinese Taipei, and Japan.
4. Thailand has the highest average scale score for students' sense of belonging to school when being compared to other Southeast Asian and East Asian countries. Perhaps, further research can be conducted to investigate what contributes high sense of belonging to school among Thai students.
5. Maybe, certain kinds of regional camp could be conducted to gather students from SEAMEO region to include not only the programs such as Young Scientists but also motivational courses.
6. As discussed in Problem Statement, mixed-method research with multiple case analysis should be conducted so that possible exemplary cases could be illustrated to support the findings why countries such as Singapore and Japan could enhance higher students' academic achievement though other countries such as Malaysia also have teachers who are qualified with job satisfaction and positive school learning environment.

Though this cross-sectional study was conducted using secondary data from TIMSS 2015, the implications of findings are worth pondering. Perhaps, future research can be conducted with exemplary cases reported on particular aspects, for example how motivation camp could enhance students' sense of school belonging as discussed in this study.

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### Declaration of Interest

Authors declare no competing interest.

### References

- Badri, M. (2019). School emphasis on academic success and TIMSS science/math achievements. *International Journal of Research in Education and Science*, 5(1), 176–189.
- Benbenishty, R., Astor, R. A., Roziner, I., & Wrabel, S. L. (2016). Testing the causal links between school climate, school violence, and school academic performance: A cross-lagged panel autoregressive model. *Educational Researcher*, 45(3), 197–206. <https://doi.org/10.3102/0013189X16644603>
- Burt, B. A., Stone, B. D., Motshubi, R., & Baber, L. D. (2020). STEM Validation among underrepresented students; leveraging insights from a STEM diversity program to broaden participation. *Journal of Diversity in Higher Education*. <https://doi.org/https://doi.org/10.1037/dhe0000300>
- Chin, C.K., Munip, H., Miyadera, R., Ng, K.T., Ch'ng, Y.S., & Promising, N. (2018). Promoting education for sustainable development in teacher education integrating blended learning and digital tools: An evaluation with exemplary cases. *Eurasia Journal of Mathematics, Science and Technology Education*, 15(1), em1653. <https://www.ejmste.com/article/promoting-education-for-sustainable-development-in-teacher-education-integrating-blended-learning-5613>



- Conner, L., Ng, K.T., Ahmad, N.J., Ab Bakar, H., Parahakaran, S. & Lay, Y.F. (2014). Evaluating students' performance for scientific literacy, reading and thinking skills in PISA 2009: Lessons learnt from New Zealand and Malaysia. In Devadason, R.P., Zurida, I., & Ng, K.T. (Eds.), (2014). *Empowering the future generation through science education*. Penang: SEAMEORECSAM. ISBN: 978-967-930-038-3 [https://www.researchgate.net/profile/Lindsey\\_Conner/publication/340525408\\_CoSMEd2013PISAFmsiaNzedi09nsent1405n03sent0506131doc/data/5e8e98b8a6fdcca78901f7db/CoSMEd2013PISAFmsiaNzedi09nsent1405n03sent0506131.doc](https://www.researchgate.net/profile/Lindsey_Conner/publication/340525408_CoSMEd2013PISAFmsiaNzedi09nsent1405n03sent0506131doc/data/5e8e98b8a6fdcca78901f7db/CoSMEd2013PISAFmsiaNzedi09nsent1405n03sent0506131.doc)
- Dicke, T., Marsh, H. W., Parker, P. D., Guo, J., Riley, P., & Waldeyer, J. (2020). Supplemental material for job satisfaction of teachers and their principals in relation to climate and student achievement. *Journal of Educational Psychology*, 112(5), 1061–1073. <https://doi.org/10.1037/edu0000409.supp>
- Gadaire, A. P., Armstrong, L. M., Cook, J. R., Kilmer, R. P., Larson, J. C., Simmons, C. J., Messinger, L. G., Thiery, T. L., & Babb, M. J. (2020). A data-guided approach to supporting students' social-emotional development in pre-k. *American Journal of Orthopsychiatry*. <https://doi.org/10.1037/prt0000522>
- Gil-Jaurena & Malek (2013). Innovation and best practice in open and distance education. *Open Praxis*. 5(4), 261-263. <https://www.openpraxis.org/index.php/OpenPraxis/article/view/103/68>
- Grissom, J. A., Loeb, S., & Nakashima, N. A. (2014). Strategic involuntary teacher transfers and teacher performance: Examining equity and efficiency. *Journal of Policy Analysis and Management*, 33(1), 112-140.
- Lay, Y. F., & Chandrasegaran, A. L. (2018). The contribution of teacher preparation on grade 8 students' science achievement in TIMSS: A comparative study between Malaysia and Singapore. *Journal of Baltic Science Education*, 17(4), 576–589. <https://doi.org/10.33225/jbse/18.17.576>
- Lay, Y.F., & Ng, K.T. (2019). The predictive effects of school safety on Southeast Asian Grade 8 students' science achievement in TIMSS 2015. *Journal Pendidikan IPA Indonesia*, 8(3), 426-435. <https://journal.unnes.ac.id/nju/index.php/jpii/article/viewFile/18898/9603>
- Linn, M. C., Gerard, L., Matuk, C., & McElhane, K. W. (2016). Science education: From separation to integration. *Review of Research in Education*, 40(1), 529–587. <https://doi.org/10.3102/0091732X16680788>
- Loganathan, P., Abdul Talib, C., Ng, K.T., Aliyu, F., & Zawadski, R. (2019). Implementing technology infused gamification in science classroom: A systematic review and suggestions for future research. *Learning Science and Mathematics (LSM) Online Journal*, 14, 60-73. [http://recsam.edu.my/sub\\_lsmjournal/images/docs/2019/2019\\_5\\_PL\\_6073\\_Final.pdf](http://recsam.edu.my/sub_lsmjournal/images/docs/2019/2019_5_PL_6073_Final.pdf)
- Mahmud, S. N. D., Mohamad Nasri, N., Samsudin, M. A., & Halim, L. (2018). Science teacher education in Malaysia: Challenges and way forward. *Asia-Pacific Science Education*, 4(8), 1-12. 153–155. <https://doi.org/10.1186/s41029-018-0026-3>
- Martin, M. O., Mullis, I. V. S., & Hooper, M. (Eds.). (2016). *Methods and Procedures in TIMSS 2015*. Retrieved from Boston College, TIMSS & PIRLS International Study Center website: <http://timssandpirls.bc.edu/publications/timss/2015-methods.html>
- Milkie, M. A., & Warner, C. H. (2011). Classroom learning environments and the mental health of first grade children. *Journal of Health and Social Behavior*, 52(1), 4–22. <https://doi.org/10.1177/0022146510394952>
- Miller, B. L., Agnich, L. E., Posick, C., & Gould, L. A. (2015). Cheating around the world: A cross-national analysis of principal reported cheating. *Journal of Criminal Justice Education*, 26(2), 211-232.
- Ministry of Education Malaysia (n.d.). Executive Summary: Malaysia Education Blueprint 2013-2025 (Preschool to Post-Secondary Education). Retrieved <https://www.studymalaysia.com/images/editordesk/executive-summary-joined.pdf>
- Mislevy, R. J., & Sheehan, K. M. (1987). Marginal estimation procedures. In A. E. Beaton (Ed.), *The NAEP 1983/84 Technical Report* (NAEP Report 15-TR-20, pp. 121–211) Princeton, NJ: Educational Testing Service.
- Mislevy, R. J., & Sheehan, K. M. (1989). Information matrices in latent-variable models. *Journal of Educational and Behavioral Statistics*, 14(4), 335-350.
- Ng, A. (2018). *School leadership preparation in Malaysia: Aims, content and impact*. Retrieved School leadership preparation in Malaysia: Aims, content and impact | Request PDF (researchgate.net)
- Ng, K.T., Baharulnizam, B., Mariam, O., Suhaidah, T., & Pang, Y.J. (2020). Managing technology-enhanced innovation programs: Framework, exemplars, and future directions. *Solid State Technology*, 63(1s), 555-565. Retrieved <http://www.solidstatetechnology.us/index.php/JSST/article/view/741>
- Ng, K.T., & Nyunt, K.A.K. (2010). The development of an on-line learning hub in SEARCH for youth science and mathematics researchers. In Z. Abas, I. Jung & J. Luca (Eds.), *Proceedings of Global Learn Asia Pacific 2010--Global Conference on Learning and Technology* (pp. 1158-1167). Penang, Malaysia: Association for the Advancement of Computing in Education (AACE). <https://www.learntechlib.org/primary/p/34320/>
- Ong, S.L., & Gonzalez, E.J. (Eds.) (2013). TIMSS 2007: What can we learn? Penang, Malaysia: SEAMEO RECSAM.
- Ong, S.L., Gonzale, E.J., & Kanageswari, S.S. (Eds.) (2014). TIMSS 2013: What can we learn together? Penang, Malaysia: SEAMEO RECSAM.
- Onjoro, V., Arago, R.B., & Embeywa, H.E. (2015). Leadership motivation and mentoring can improve efficiency of a classroom teacher and workers in institutions. *Journal of Education and Practice*, 6(15), 1-15.
- Pang, Y.J., Tay, C.C., Ahmad, S.S.S., & Ng, K.T. (2019). Promoting students' interest in STEM education through robotics competition-based learning: Case exemplars and the way forward. In *Learning Science and Mathematics (LSM) Online Journal*. Issue 14 December 2019. Pp. 107-121. [https://www.recsam.edu.my/sub\\_lsmjournal/images/docs/2019/2019\\_8\\_PYJ\\_107121\\_Final.pdf](https://www.recsam.edu.my/sub_lsmjournal/images/docs/2019/2019_8_PYJ_107121_Final.pdf)
- Rjosk, C., Richter, D., Lüdtke, O., & Eccles, J. S. (2017). Ethnic composition and heterogeneity in the classroom: Their measurement and relationship with student outcomes. *Journal of Educational Psychology*, 109(8), 1188–1204. <https://doi.org/10.1037/edu0000185>



- Robinson, K. A., Beymer, P. N., Ranellucci, J., & Schmidt, J. A. (2020). Momentary emotion profiles in high school science and their relations to control, value, achievement, and science career intentions. *Motivation Science*, 6(4), 401-412. <https://doi.org/10.1037/mot0000174>
- Rubin, D. B. (1987). The calculation of posterior distributions by data augmentation: Comment: A noniterative sampling/importance resampling alternative to the data augmentation algorithm for creating a few imputations when fractions of missing information are modest: The SIR algorithm. *Journal of the American Statistical Association*, 82(398), 543-546.
- Schonert-Reichl, K. (2017). Social and emotional learning and teachers. *The Future of Children*, 27(1), 137-155. <http://www.jstor.org/stable/44219025>
- Sjöberg, S. (2015). PISA and global educational governance: A critique of the project, its uses and implications. *Eurasia Journal of Mathematics, Science and Technology Education*, 11(1), 111-127.
- Skaalvik, E. M., & Skaalvik, S. (2011). Teacher job satisfaction and motivation to leave the teaching profession: Relations with school context, feeling of belonging, and emotional exhaustion. *Teaching and Teacher Education*, 27(6), 1029-1038. <https://doi.org/10.1016/j.tate.2011.04.001>
- Starr, J. P. (2018). Leadership: Reducing suspensions or building relationships? Reframing the problem. *Phi Delta Kappan*, 99(8), 72-73. <https://doi.org/10.1177/0031721718775684>

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