



THE PREDICTIVE EFFECTS OF SCHOOL SAFETY ON SOUTHEAST ASIAN GRADE 8 STUDENTS' SCIENCE ACHIEVEMENT IN TIMSS 2015

Y. F. Lay*¹ and K. T. Ng²

¹Universiti Malaysia Sabah, Malaysia

²SEAMEO RECSAM, Malaysia

DOI: 10.15294/jpii.v8i3.18898

Accepted: April 17th, 2018. Approved: September 28th, 2019. Published: September 30th, 2019

ABSTRACT

This research explored the predictive effects of school safety on science achievement among Southeast Asian eighth graders in TIMSS 2015. In this research, principals' responses of School Discipline Problems Scale, teachers' responses of Safe and Orderly School Scale, as well as students' responses on the Student Bullying Scale were reported. The data were obtained from 9,726 Malaysian students, 6,116 Singaporean students, and 6,482 Thai students who participated in TIMSS 2015. The secondary data analysis using International Database (IDB) Analyzer revealed that principals' reports of school discipline problems were significantly linked to Grade 8 students' science achievement in Malaysia, Singapore, and Thailand. Science teachers' reports of safe and orderly school were significantly linked to Singaporean eighth graders' science achievement. Student bullying was significantly linked to Grade 8 students' science achievement in Malaysia and Singapore. Administrators, educators, and policymakers who wish to improve students' science achievement in TIMSS would benefit from the findings of this research that revealed research evidences on significant impact of school safety involving cybersecurity. Awareness should be raised on the need to have more precautions taken on school safety especially on cybersecurity in the advent of digital era, learning from a country with success stories on school safety and cybersecurity such as Singapore.

© 2019 Science Education Study Program FMIPA UNNES Semarang

Keywords: science achievement, school discipline problems, school safety, student bullying, school safety, science achievement, TIMSS

INTRODUCTION

The issues of security have been the perennial global concerns not only in developing and developed nations of Southeast Asia region but also globally as reported by Collins (2003) and Smith (2004) respectively. Among the critical concerns in the advent of digital era in many educational systems are school safety, cybersecurity, and cyber ethics that were reported widely in news (e.g., Nobullying.com, 2015) and some research studies (e.g., by Masrom et al., 2012;

Kritzing, 2015; Kallberg & Thuraisingham, 2012) but still lack supportive and corrective action plans, hence much research urgency with preventive measure is needed.

In the recent years, there are increasing evidences of many forms of threats including not only direct but also indirect bullying or sometimes being referred to as cyberbullying (Nobullying.com, 2015), cybercrime (McQuade, 2006; Moore, 2010) and terrorism (Enders & Sandler, 2011; Hoffman, 2006). In addition, the acts of bullying are still increasing and Malaysia as one of the Asian countries is facing a high percentage of kids who are bullied at schools. It has reached

the alarming statistic of 64%.

Effective implementation of educational policies, curricula/resources, and pedagogical approaches is always believed to have effects on the students' academic performance. But what students experience within and beyond the classroom (e.g., their learning environment) are more likely to have a more direct impact on their learning. Hence in an effort to build a better relation between curriculum and instruction in safe environment, the concept of student's engagement in content through pedagogical approaches supported by environment that is safe and conducive is believed to have the most influence on student's learning. This aspect has been highlighted by many researchers, such as Parsons & Taylor (2011), and Zepke & Leach (2010).

The engagement of learning content involving pedagogical approaches supported by conducive learning environments taking into consideration the safety of school are also among the factors identified in the Trends in International Mathematics and Science Study (TIMSS). TIMSS is an international comparative study initiated by the International Association for the Evaluation of Educational Achievement (or known as IEA) since 1995 through international comparative research (Robitaille & Donn, 1993). Since then, it contributed to further understanding about how Information Technologies are affecting the way students learn in schools as well as what works in education and why.

There were many multi-faceted factors contributing to science performance in TIMSS that have been broadly researched in the recent years, among which include the affective (i.e., attitude, interest, motivation, and values), cognitive, and socio-cultural aspects. For example, much emphasis has been placed by the Malaysian government to benchmark students' cognitive performance against international standards through participating in a comparative study such as TIMSS (Ministry of Education, 2012) since early year till recently. Various policy makers and researchers who wish to see the improvement in the quality of educational systems in Malaysia had conducted TIMSS studies as reported in Ong & Gonzalez (2012) as well as Ong et al. (2013).

Although there are 11 ASEAN countries in the region, only 3 out of the 11 SEAMEO (Southeast Asian Ministers of Education Organisation) member countries, including Malaysia, Singapore, and Thailand, participated in TIMSS 2015. Nevertheless, unlike their counterpart Singapore that was evaluated consistently high as top ranking achiever in mathematics and science, both Malaysia and Thailand were only ranked at the 24th and 28th places respectively in TIMSS

2015 science assessment at the eighth grade. These two countries were also ranked at the 22nd and 30th respectively at the eighth grade of mathematics assessment in TIMSS 2015. Therefore, there is a lot for a country like Malaysia to learn from the neighbouring country Singapore and emulate their success stories.

This study aims at exploring the predictive effects of school safety on science achievement among Southeast Asian eighth graders in TIMSS 2015 through international comparative research among Malaysia, Singapore, and Thailand as preventive measure in raising awareness on the security issues affecting learning environments. However, this research will only focus on the main aspects related to school safety as discussed in the following paragraphs.

The quality of the teaching and learning of mathematics and science among Grades 4 and 8 students across participating countries was assessed by TIMSS (Martin et al., 2012; Reddy et al., 2016; Chen et al., 2012). In the recent cycle of TIMSS, the findings revealed that Japan, Russian Federation, Hong Kong SAR, Singapore, and Korea are listed as the top five achievers with the latter two, i.e. Singapore and Korea are the top achievers in science at the fourth grade. At the eighth grade, Japan, Chinese Taipei, Korea, Singapore, and Slovenia are listed in the top five with Singapore is the top achiever in science. East Asian countries like Chinese Taipei, Japan, Hong Kong SAR, Korea, and Singapore are also the top achievers in mathematics at the fourth grade and eighth grade.

Singapore joined the TIMSS at both the fourth and eighth grade levels since 1995. But Malaysia only joined the programme at the eighth grade level in 1999. In the same year 1999, Thailand joined the program at both the fourth and eighth grade levels. The following Table 1 provides a summary of the Grade 8 science performance Malaysia, Singapore, and Thailand from TIMSS 1995 to TIMSS 2015.

Table 1. TIMSS (Grade 8) science scores for Malaysia, Singapore, and Thailand (1995 – 2015)

Year	No. of Participating Countries	TIMSS Science Scores of Grade 8 Students		
		Malaysia	Singapore	Thailand
1995	45	-	580	-
1999	38	492	568	482
2003	46	510	578	-
2007	59	471	567	471
2011	63	426	590	451
2015	46	471	597	456

Source: Martin et al. (2012)

*Correspondence Address
E-mail: layyoonfah@yahoo.com.my

In the context of education, the meaning of 'safety' includes the practices that protect children from injury or risk. It is a key aspect of good learning or living environment provided to children. 'School safety' includes first aid; precautionary process of emergency or fire; supervision of children; protection of personal belongings; prevention of school disciplinary problems and safety measures that may encompass aspects such as student direct or indirect bullying (also being referred to as cyberbullying) as well as the abuse of substance for example, alcohol, drugs, tobacco, to name a few (Childcarelink, n.d.; Marotz, 2014).

The research on the effect of school safety on student achievement was conducted but some findings were controversial. Literature revealed that while schools in high-crime and high-poverty neighbourhoods tend to be less safe than other schools as reported by Sparks (2011), school safety plays a bigger role in influencing students' level of academic achievement and not so much on the neighbourhood or surroundings of the school. Some interesting findings were also revealed from the research by Duszka (2015) regarding the effects of school safety on school performance. The mean safety score of a school was statistically significant ($p < .01$) for the elementary model. On average, there is an increase of 1 percent point in the mean school safety resulted in the school's combined Florida Comprehensive Assessment Test (FCAT) (a standardized test on students' abilities in reading, math, writing, and science) score with the increase of approximately 18 points, and every variable in the model was statistically significant. However, there was no relationship found in both the models of middle and high school, and the mean safety score of a school was statistically insignificant.

Providing blended-mode safe learning place considering safe and orderly school has been the concern of many educational systems as reflected also in the SEAMEO's seven priority areas (SEAMEO, 2015; Valenzuela, 2016; Weitz et al., 2018). These areas of concern include 'safe school concept, safe traffic, safe learning environment, and school safety network' that are identified under Priority 3 to enhance resiliency in the face of emergencies (SEAMEO, 2015). Suggestions were also given by NEALS (2010) that a common framework for respectful communication should be provided. This is aimed to enable professional (including staff in charge of child protection, licensed children's services, and so forth) as well as schools to provide effective and also timely intervention for children and young

people who might be at risk of abuse or neglect. This is because child protection policy must be based on the principle of shared responsibility and partnership.

School safety was revealed to be able to improve student achievement if consideration is made to improve the emergency preparedness, safety, and security that are time efficient with cost-effective ways of improving school organizations effectively while preventing human suffering as discussed by Artis (2019), Cornell & Mayer (2010), Dorn (2010), and Perše et al. (2011). It is also pertinent in the digital era to review literature on safety of blended learning environment since related question (e.g. online posting) is also raised in TIMSS 2015. Cybersafety, or being safe online, is a common term used to describe an action, a set of practices, and/or measures to protect our computer or personal information from being attacked. Among the examples of the threats of cyber safety on individuals include cyberbullies (i.e. using Internet to intimidate or harass others), inappropriate or disturbing content, invasion of privacy and online predators (i.e. the use of Internet to trick somebody into meeting in person), to name a few. Hoaxes, identity theft, phishing, and spam are among the examples of the threats of cyber safety on computer in general. Spyware, Trojans, and viruses/worms are examples of cyber safety threats to computer security. To ensure school safety, the following are suggested as action steps: (1) be a good digital citizen by abiding by the cyber safety tips, netiquette; (2) create smart passwords; (3) report inappropriate sites and cyberbullying (Coyne & Gountsidou, 2013; Intel, 2011; Ross, 2011; Stewart, 2015).

The issues of direct and indirect bullying (also called cyberbullying) were given much attention among the public (Bullying.com, 2015, 2017). There were many injury and fatal cases happening recently in Malaysia involving individual student or group direct/indirect bullying or murdering cases, some of whom have committed suicide due to e.g. cyberbullying. Hence, the issues of school safety and cybersecurity are getting more serious as reported by Hansen & Nissenbaum (2009), Ling (2017), Mohd. Ikhwan (2017), and Sadho (2017). It is thus critical to raise awareness on the need to have more precautions taken on school safety especially on cybersecurity in the advent of digital era, learning from country with success stories on school safety and cybersecurity such as Singapore. Albert Einstein (n.d.) once said, 'Try not to become a man of success, but rather try to become a man of value'. Hence education must be defined as something related

to 'desirable qualities' that man should possess as pointed out by Boulifa & Kaaouachi (2015), Chudgar et al. (2012), and Hirst & Peters (1970). The high percentage of bullying cases in Malaysia is getting more and more alarming as reported by Nobullying.com (2015). It is thus timely that more educational activities should be implemented as part of the precautionary measures to promote school safety to enhance awareness of cybersecurity and inculcate moral values. Hence, this study aimed to explore the contribution of school safety on science achievement among Southeast Asian eighth graders in TIMSS 2015.

METHODS

TIMSS is one of the projects of the International Association for the Evaluation of Educational Achievement (IEA), an independent cooperative of national educational research institutions and governmental research agencies dedicated to improve education. TIMSS is conducted every four years on a regular cycle to assess fourth and eighth grade students' achievement in science and mathematics. The international comparative research project is dedicated to providing participating countries with information to improve teaching and learning in science and mathematics.

TIMSS 2015 international assessment of student achievement at the eighth grade comprises written tests together with sets of questionnaires that gather information on the educational and social contexts for achievement in science and mathematics. TIMSS 2015 employed a two-stage random sample design, with a sample of schools drawn as a first stage and one or more intact classes of students selected from each of the sampled schools as a second stage.

This study was a non-experimental quantitative survey using freely-downloadable secondary data extracted from the database (URL: <http://timssandpirls.bc.edu/timss2015/international-database/>). These include a total of 22,324 Grade 8 students who participated in the TIMSS 2015 assessment and they were from Malaysia (N = 9,726), Singapore (N = 6,116), as well as Thailand (N = 6,482).

Teachers' Responses on Safe and Orderly School

Students participating in TIMSS 2015 were scored according to their teachers' perceived levels of agreement with statements on the Safe and Orderly School Scale that was based on eight items (Refer BTBG07A to BTBG07H as reflected

under the first sub-heading of Table 2). All the eight items were rated on a 4-point Likert-type scale, ranging from '1' (Disagree a lot) to '4' (Agree a lot). The Cronbach's alpha reliability coefficients for the scale were .857, .897, and .838 for Malaysia, Singapore, and Thailand, respectively.

Principals' Responses on School Discipline Problems

Students participating in TIMSS 2015 were scored according to their principals' responses concerning potential school problems. These responses are based on the School Discipline Problems Scale with eleven items (Refer BCBG15A to BCBG15K as reflected under the second sub-heading of Table 2). All these eleven items were rated on a 4-point Likert-type scale, ranging from '1' (Serious problem) to '4' (Not a problem). The Cronbach's alpha reliability coefficients for the scale were .885, .935, .921 for Malaysia, Singapore, and Thailand, respectively.

Students' Responses on Student Bullying

Students participating in TIMSS 2015 were scored according to their responses on how often they experienced bullying behaviours on the Student Bullying Scale that was based on nine items (Refer BSBG16A to BSBG16I as reflected under the third sub-heading of Table 2). All the nine items were rated on a 4-point Likert type scale, ranging from '1' (At least once a week) to '4' (Never). The Cronbach's alpha reliability coefficients for the scale were .810, .838, and .802 for Malaysia, Singapore, and Thailand, respectively.

Science Achievement

The science achievement scale of TIMSS 2015 was based on items including content (in Biology, Chemistry, Earth Science, Physics) as well as cognitive domains in science (such as Knowing, Applying, Reasoning). TIMSS uses an imputation methodology, involving plausible values, to report student performance. Plausible values that are based on the imputation theory of Rubin (1987) as well as consisting of an approach developed by Mislevy & Sheehan (1987, 1989) are random elements from the set of scores. These scores are randomly drawn from the marginal posterior of the latent distribution that are used as a measure of science achievement. To combine the five plausible values as well as to produce their average values and corrected standard errors, a plug-in for SPSS namely The International Database (IDB) Analyzer for TIMSS by IEA was used. The following demographic characteristic of students participating in this research e.g. gen-

der (dummy coded as 0 = 'female', 1 = 'male') was also included as a control variable apart from the aforementioned measures.

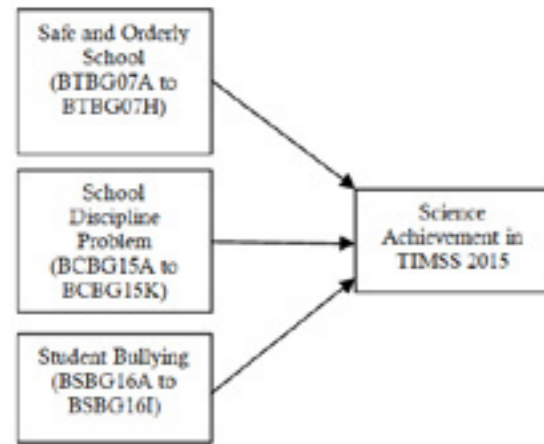


Figure 1. A Conceptual Framework

RESULTS AND DISCUSSION

This section displays the results of data analysis summarised in Tables 2 to 9 reflecting the focus of this study to examine the predictive effects of school safety on science achievement among Southeast Asian eighth graders in TIMSS 2015.

As illustrated in Table 2 that shows the average scale scores, Singaporean students were in schools with hardly any problems as reported by their principals. However, students in Malaysian and Thailand have minor problems in schools. Singaporean students were in very safe and orderly schools as reported by their teachers as compared to the students in Malaysian and Thailand who are in safe and orderly schools. Singaporean and Malaysian students were almost never being bullied. Nevertheless, Thai students were bullied about every month.

Table 1. Descriptive Statistics (Weighted) with Average Scale Scores for Safe and Orderly School (Teachers' Responses), School Discipline Problems (Principals' Responses), as well as Student Bullying (Students' Responses)

Code	Statement	Malaysia		Singapore		Thailand	
		M	SD	M	SD	M	SD
Teachers' responses on safe and orderly school (BTBGSOS)							
BTBG07A	This schools is located in as safe neighborhood	3.46	.632	3.80	.461	3.47	.699
BTBG07B	I feel safe at this school	3.58	.538	3.81	.456	3.61	.571
BTBG07C	This school's security policies and practices are sufficient	3.30	.633	3.67	.559	3.41	.621
BTBG07D	The students behave in an orderly manner	3.16	.591	3.27	.762	2.95	.691
BTBG07E	The students are respectful of the teachers	3.16	.602	3.29	.723	3.25	.652
BTBG07F	The students respect schools properly	2.73	.691	3.13	.799	2.88	.733
BTBG07G	This school has clear rules about student conduct	3.52	.600	3.60	.617	3.39	.656
BTBG07H	This school's rules are enforced in a fair and consistent manner	3.40	.650	3.46	.688	3.41	.662
Average scale score		9.78(.13)		11.29 (.09)		10.08 (.15)	
Note: 1 = disagree a lot; 2 = disagree a little; 3 = agree a little; 4 = agree a lot; standard errors in parentheses							
Principals' responses on school discipline problem (BCBGDAS)							
BCBG15A	Arriving late at school	3.35	.691	3.26	.529	2.94	.751
BCBG15B	Absenteeism (i.e., unjustified absence)	3.11	.874	3.41	.581	2.90	.832
BCBG15C	Classroom disturbance	3.20	.687	3.32	.540	3.12	.658
BCBG15D	Cheating	3.55	.557	3.80	.400	3.48	.666
BCBG15E	Profanity	3.50	.609	3.62	.523	2.98	.684
BCBG15F	Vandalism	3.22	.702	3.79	.407	3.34	.674
BCBG15G	Theft	3.37	.623	3.73	.442	3.55	.595
BCBG15H	Intimidation or verbal abuse among students (including texting, emailing, etc.)	3.57	.544	3.40	.571	3.49	.585
BCBG15I	Physical injury to other students	3.70	.495	3.83	.372	3.51	.617
BCBG15J	Intimidation or verbal abuse among students (including texting, emailing, etc.)	3.82	.412	3.86	.349	3.88	.372

BCBG15K	Physical injury to teachers or staff	3.97	.224	4.00	.000	3.94	.302
Average scale score		10.77(.15)		11.67 (.00)		10.44 (.14)	
Note: 1 = serious problem; 2 = moderate problem; 3 = minor problem; 4 = not a problem; standard errors in parentheses							
Students' responses on student bullying (BSBGSB)							
BSBG16A	Made fun of me or claeed me names	2.55	1.18	2.27	1.10	2.76	1.21
BSBG16B	Left me out of their games or activities	1.61	.93	1.80	.94	1.52	.93
BSBG16C	Spread lines about me	1.73	.93	1.67	.88	2.42	1.11
BSBG16D	Stole something from me	1.83	.94	1.30	.66	2.08	1.08
BSBG16E	Hit or hurt me (e.g., shoving, hitting, kicking)	1.37	.77	1.50	.85	1.97	1.15
BSBG16F	Made me do thing I didn't want to do	1.51	.86	1.44	.76	1.85	1.04
BSBG16G	Shared embarrassing information with me	1.55	.86	1.54	.82	1.66	.95
BSBG16H	Posted embarrassing things about me online	1.31	.69	1.22	.56	1.26	.67
BSBG16I	Threatened me	1.28	.67	1.21		1.29	.72
Average scale score		9.33 (.05)		9.70 (.03)		8.80 (.04)	
Note: 1 = at least once a week; 2 = once or twice a month; 3 = a few times a year; 4 = never; standard errors in parentheses							

The analysis of data on the percentage of Southeast Asian students according to categories of safe and orderly school, school discipline problems, as well as student bullying with their respective average science achievement is illustrated in Tables 3 to 5 respectively.

Teachers' Responses on Safe and Orderly School

Table 3. Teachers' Responses on Safe and Orderly School

Country	N	Very Safe and Orderly		Safe and Orderly		Less than Safe and Orderly		Average Scale Score
		%	Average Achievement	%	Average Achievement	%	Average Achievement	
Malaysia	9,033	32.35 (3.82)	477.56 (7.23)	61.82 (4.25)	464.28 (6.43)	5.83 (1.95)	458.73 (23.64)	9.78 (.13)
Singapore	6,098	63.76 (2.17)	606.29 (4.20)	32.88 (2.15)	582.09 (7.87)	3.37 (.82)	571.18 (15.01)	11.29 (.09)
Thailand	6,482	42.30 (3.78)	460.71 (6.96)	51.96 (3.86)	451.11 (6.06)	5.74 (1.70)	462.84 (21.40)	10.08 (.15)
Average		46.14 (1.93)	514.85 (3.62)	48.88 (2.04)	499.16 (3.94)	4.98 (.90)	497.59 (11.75)	

Note: Standard errors in parentheses

Table 3 summarises teachers' responses on safe and orderly school of which 63.76% (the highest) of Singapore responded very safe and orderly, as compared with only 42.30% of Thai teachers and 32.35% of Malaysian teachers reported very safe and orderly. On the contrary, Malaysian teachers reported the least safe and orderly (5.83%) as compared to Thai teachers (5.74%) and Singapore teachers (3.37%).

Principals' Responses on School Discipline Problems

Table 4. Principals' Responses on School Discipline Problems

Country	N	Hardly Any Problems		Minor Problems		Moderate to Severe Problems		Average Scale Score
		%	Average Achievement	%	Average Achievement	%	Average Achievement	
Malaysia	9,636	49.51 (4.59)	484.43 (5.88)	47.60 (4.44)	456.32 (6.58)	2.90 (2.11)	475.73 (12.42)	10.77 (.15)

Singapore	5,945	74.17 (.00)	605.60 (3.55)	25.83 (.00)	571.44 (6.89)			11.67 (.00)
Thailand	6,452	42.28 (4.04)	472.70 (6.01)	53.21 (3.96)	444.02 (5.97)	4.52 (1.73)	433.01 (13.68)	10.44 (.14)
Average		55.32 (2.04)	520.91 (3.04)	42.21 (1.98)	490.59 (3.75)	2.47 (.91)	454.37 (9.24)	

Note: Standard errors in parentheses

Based on the information from Table 4, it can be seen that the principals' responses on school discipline problem is the best among the three countries, with 74.17% (the highest) responded there are hardly any problems related to school discipline and none of them responded

there are moderate to severe problems. Whereas Thailand's principal responded with the highest percentage (4.52%) among the three countries compared on moderate to severe problems experienced in school discipline.

Students' Responses on Student Bullying

Table 5. Students' Responses on Student Bullying

Country	N	Almost Never		About Monthly		About Weekly		Average Scale Score
		%	Average Achievement	%	Average Achievement	%	Average Achievement	
Malaysia	9,693	47.65 (1.12)	488.99 (3.57)	41.73 (.69)	466.65 (4.20)	10.62 (.80)	410.47 (8.73)	9.33 (.05)
Singapore	6,092	57.63 (.76)	603.46 (2.98)	35.96 (.73)	591.82 (3.78)	6.41 (.37)	562.93 (7.39)	9.70 (.03)
Thailand	6,456	33.07 (1.10)	458.10 (4.89)	50.14 (.90)	460.43 (4.53)	16.80 (.84)	438.40 (4.91)	8.80 (.04)
Average		46.12 (.58)	516.85 (2.25)	42.61 (.45)	506.30 (2.41)	11.28 (.41)	470.60 (4.15)	

Note: Standard errors in parentheses

From the illustration of data as shown in Table 5, Singapore again shows the highest percentage with 57.63% students responded almost never experienced student bullying, and the lowest percentage with 6.41% responded on student bullying about weekly. On the contrary,

Thailand students' responses on student bullying about weekly is the highest percentage (16.8%) among the three countries. Only 33.07% (the lowest among the three countries) reported almost never experience on student bullying.

Table 6. Correlations between safe and orderly school (teachers' responses), school discipline problems (principals' responses), as well as student bullying (students' responses) with science achievement

Malaysia		
	R	SE
BCBGDAS	.17*	.05
BTBGSOS	.09	.05
BSBGSB	.21*	.02
Singapore		
	R	SE
BCBGDAS	.25*	.04
BTBGSOS	.21*	.05
BSBGSB	.09*	.02
Thailand		
	R	SE
BCBGDAS	.19*	.05
BTBGSOS	.04	.06
BSBGSB	.04	.02

**p* < .05; BCBGDAS = School Discipline Problems; BTBGSOS = Safe and Orderly School; BSBGSB = School Bullying

To determine whether or not school safety was predictive of Southeast Asian Grade 8 students' science achievement, the correlation and simultaneous multiple regression analyses were conducted separately for each education system as illustrated in Table 6 to Table 9.

The analysis of results in Table 6 reveals that there was significant relationship between principals' reports of school discipline problems with Grade 8 students' science achievement in

Malaysia, Singapore, and Thailand (*r* = .17, .25, and .19, respectively). There was significant correlation between Singaporean science teachers' reports of safe and orderly school with their Grade 8 students' science achievement. There were also significant associations between student bullying as well as the Grade 8 students' science achievement in Malaysia and Singapore respectively.

Table 7. Teachers', principals, and students' responses on safe and orderly school, school discipline problems, and student bullying in predicting Southeast Asian Grade 8 students' science achievement

	Malaysia		Singapore		Thailand	
	B	SE	B	SE	B	SE
Constant	422.26*	30.67	504.97*	22.22	437.57*	28.02
BTBGSOS	4.70	2.97	8.17*	1.87	1.81	2.70
Adjusted R ²	.01		.04		.00	
Constant	361.22*	31.63	437.34*	24.95	354.00*	28.53
BCBGDAS	10.17*	2.90	13.66*	2.06	9.73*	2.73
Adjusted R ²	.03		.06		.04	
Constant	371.81*	13.80	551.34*	9.07	450.33*	8.16
Gender	-3.32	3.21	3.70	3.68	-19.31*	4.80
BSBGSB	10.85*	1.28	4.48*	.80	1.65	.85
Adjusted R ²	.04		.01		.02	

**p* < .05; BTBGSOS = Safe and Orderly School; BCBGDAS = School Discipline Problems; BSBGSB = Student Bullying

Based on the information from Table 7, there are evidences that the significant β values of safe and orderly school contributed significantly (8.17) to students' science achievement as reported by Singaporean science teachers. It was shown that there was significant association between principals' reports of school discipline problems as well as Grade 8 students' science achievement in Malaysia, Singapore, and Thailand (β = 10.17, 13.66, and 9.73, respectively). There was significant contribution of the β values of student bullying towards students' science achievement in Malaysia and Singapore (i.e., 10.85 and 4.48, respectively). On the contrary, Thai female students scored significantly higher than their male counterparts on the TIMSS 2015 science assessment.

vement worth further exploration using second generation statistical technique such as Structural Equation Modeling (SEM) in an attempt to fill the knowledge gap in this research area. In addition, this research involved non-experimental survey research using only secondary data drawn from the TIMSS 2015 database. Perhaps some experimental research studies should be considered in future research to investigate the predictive effects of 'Moral ethics and values-based education' as well as 'Safe and Orderly School' on students' science achievement.

CONCLUSION

Future researches to explore the predictive effects of student-level and teacher-level factors on eighth grade students' science achievement seem crucial and warranted for further investigation. On top of that, the interplay relationships between student-level, teacher-level, and school-level factors in influencing students' science achieve-

Secondary data analysis using TIMSS 2015 data reveals the significant contribution of principals' reports of 'school discipline problems' towards science achievement of Grade 8 students in Malaysia, Singapore, and Thailand. Science teachers' reports of 'safe and orderly school' show significant contribution towards Singaporean eighth graders' science achievement. Students' responses on 'student bullying' also show signifi-

cant contribution to science achievement of Grade 8 students in Malaysia and Singapore except Thailand.

However, the adjusted R^2 values (within the range of .01 to .06) indicates that the variability in science achievement accounted for by school discipline problem, safe and orderly school, and student bullying was relatively low, respectively. Despite that, there were evidences from this research on the importance to maintain safe and orderly school to optimise learning and enhance students' science achievement. Hence, administrators, science educators, and policy makers who wish to improve students' science achievement in TIMSS would be benefitted from the findings of this research that reveal empirical evidences on significant impact of school safety.

REFERENCES

- Artis, S. M. (2019). *Improving Student Achievement through the Implementation of a Classroom Performance System*. Doctoral Dissertation. Nova Southeastern University. Retrieved from NSUWorks, Abraham S. Fischler College of Education. (183) https://nsuworks.nova.edu/fse_etd/183.
- Boulifa, K., & Kaaouachi, A. (2015). The Relationship between Students' Perception of Being Safe in School, Principals' Perception of School Climate and Science Achievement in TIMSS 2007: A Comparison between Urban and Rural Public School. *International Education Studies*, 8(1), 100-112.
- Chen, S. F., Lin, C. Y., Wang, J. R., Lin, S. W., & Kao, H. L. (2012). A Cross-Grade Comparison to Examine the Context Effect on the Relationships Among Family Resources, School Climate, Learning Participation, Science Attitude, And Science Achievement Based on TIMSS 2003 in Taiwan. *International Journal of Science Education*, 34(14), 2089-2106.
- Childcarelink(n.d.). Safety/Health/Hygiene/Nutrition. Retrieved from <https://www.childcarelink.gov.sg/ccls/docs/BP04-Safety.pdf>
- Chudgar, A., Luschei, T. F., & Zhou, Y. (2012). Science and Mathematics Achievement and the Importance of Classroom Composition: Multi-country Analysis Using TIMSS 2007. *American Journal of Education*, 119(2), 295-316.
- Collins, A. (2003). *Security and Southeast Asia: Domestic, Regional and Global Issues* [e-book]. Retrieved from <https://bit.ly/2mh1b5o>.
- Cornell, D. G., & Mayer, M. J. (2010). Why Do School Order and Safety Matter?. *Educational Researcher*, 39(1), 7-15.
- Coyne, I., & Gountsidou, V. (2013). The Role of the Industry in Reducing Cyberbullying. In *Cyberbullying through the New Media* (pp. 101-116). Psychology Press.
- Dorn, M. (2010). How School Safety Can Improve Student Achievement. *The Campus Safety Magazine*. Retrieved from <http://www.campusafety-magazine.com/article/Using-School-Safety-to-Improve-Student-Achievement>
- Duszka, C. (2015). The Effects of School Safety on School Performance. *International Journal of Education and Social Science*, 2(8), 29-37.
- Enders, W., & Sandler, T. (2011). *The Political Economy of Terrorism*. Cambridge University Press.
- Hansen, L., & Nissenbaum, H. (2009). Digital Disaster, Cyber Security, and the Copenhagen School. *International Studies Quarterly*, 53(4), 1155-1175.
- Hirst, P.H., & Peters, R.S. (1970). *The Logic of Education*. London: Routledge and Kegan Paul.
- Hoffman, B. (2006). *Inside Terrorism* [e-book]. Retrieved from <https://bit.ly/2kIO36r>.
- Intel. (2011). *Intel Teach Elements: Collaboration in the Digital Classroom*. US: Intel Corporation.
- Kallberg, J., & Thuraisingham, B. (2012, June). Towards Cyber Operations-The New Role of Academic Cyber Security Research and Education. In *2012 IEEE International Conference on Intelligence and Security Informatics* (pp. 132-134). IEEE.
- Kritzinger, E. (2015, July). Enhancing Cyber Safety Awareness among School Children in South Africa through Gaming. In *2015 Science and Information Conference (SAI)* (pp. 1243-1248). IEEE.
- Ling, K. (2017). Viral Cyber Bullied TARUC Student Commits Suicide. Friends Urge Bullies to Apologise at Funeral. Retrieved June 14, 2017 from <http://www.worldofbuzz.com/cyber-bullied-taruc-student-commits-suicide-friends-urge-bullies-apologise-funeral/>
- Marotz, L. R. (2014). *Health, Safety, and Nutrition for the Young Child*. Nelson Education.
- Martin, M. O., Mullis, I. V., Foy, P., & Stanco, G. M. (2012). *TIMSS 2011 International Results in Science*. International Association for the Evaluation of Educational Achievement. Herengracht 487, Amsterdam, 1017 BT, The Netherlands.
- Masrom, M., Mahmood, N. H. N., Zainon, O., Wan, H. L., & Jamal, N. (2012). Information and Communication Technology Issues: A Case of Malaysian Primary School. *ARPN Journal of Science and Technology*, 2(5), 504-511.
- McQuade, S. C. (2006). *Understanding and Managing Cybercrime*. Boston: Pearson/Allyn and Bacon.
- Ministry of Education. (2012). *Malaysia Education Blueprint 2013-2025. Preliminary Report- Executive Summary*. Kuala Lumpur: Ministry of Education (MOE) Malaysia.
- 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.
- Mohd. Ikhwan, J. (2017). Nilai Bullies Force Schoolmate to Ingest Poison. Retrieved from <https://www.nst.com.my/news/nation/2017/04/234631/nilai-bullies-force-schoolmate-ingest-poison>
- Moore, R. (2010). *Cybercrime: Investigating High-Technology Computer Crime*. 2nd Edition. New York: Routledge, Taylor & Francis group. Retrieved from <https://www.taylorfrancis.com/books/9781315721767>
- NEALS. (2010). *Protecting the Safety and Wellbeing of Children and Young People*. Melbourne: Department of Education and Early Childhood Development and Department of Human Services. Retrieved from <https://www.education.vic.gov.au/school/principals/spag/safety/Documents/protectionofchildren.PDF>
- NoBullying.com (2015). *Bullying in Malaysia*. Retrieved June 14, 2017 from <https://nobullying.com/bullying-in-malaysia/>
- Ong, S. L., & Gonzalez, E. J. (2012). *TIMSS 2007: What Can We Learn?* (Eds.). Penang: SEAMEO-RECSAM.
- Ong, S. L., Gonzalez, E. J., & Shanmugam, S. K. S. (2013). TIMSS 2011: What Can We Learn Together in Reaching Greater Heights. *Penang, Malaysia: SEAMEO-RECSAM*.
- Parsons, J., & Taylor, L. (2011). Improving Student Engagement. *Current Issues in Education*, 14(1). Retrieved from <https://cie.asu.edu/ojs/index.php/cieatasu/article/view/745>
- Perše, T. V., Kozina, A., & Leban, T. R. (2011). Negative School Factors and their Influence on Math and Science Achievement in TIMSS 2003. *Educational Studies*, 37(3), 265-276.
- Reddy, V., Visser, M., Winnaar, L., Arends, F., Juan, A.L., Prinsloo, C. & Isdale, K. (2016) TIMSS 2015: Highlights of Mathematics and Science Achievement of Grade 9 South African learners. (Commissioned by the Department of Basic Education, December).
- Robitaille, D. F., & Donn, J. S. (1993). TIMSS: The Third International Mathematics and Science Study. In *Investigations into Assessment in Mathematics Education* (pp. 229-244). Springer, Dordrecht.
- Ross, S.T. (2011). *Netiquette*. Retrieved from <http://www.albion.com/netiquette/corerules.html>
- Rubin, D. B. (1987). *Multiple Imputation for Nonresponse in Surveys*. New York: Wiley.
- Sadho, R. (2017). *RIP Zulfarhan: The Navy Cadet Who was Tortured to Death by His Fellow UPNM Students*. Retrieved from <http://says.com/my/news/bound-beaten-and-burned-the-navy-cadet-who-was-tortured-to-death-by-his-fellow-students>
- SEAMEO. (2015). *What is SEAMEO?* Retrieved from http://www.seameo.org/SEAMEOWeb2/index.php?option=com_content&view=article&id=90&Itemid=517
- Smith, P. K. (Ed.). (2004). *Violence in Schools: The Response in Europe*. Routledge.
- Sparks, S. D. (2011). Study Links School Safety to Achievement, Relationships. *Education Week*, May, 10. Retrieved from <https://educatenow.net/wp-content/uploads/2011/05/Education-Week-Study-Links-School-Safety-to-Achievement-Relationships.pdf>
- Stewart, W. (2015). *Netiquette*. Retrieved June 14, 2017 from http://www.livinginternet.com/ia_nq.htm
- Valenzuela, E.A.P. (2016). *SEAMEO Seven Priority Areas (2015-2035) and the Education Agenda 2030*. Retrieved February 2, 2018 from http://www.unescobkk.org/fileadmin/user_upload/efa/Education_2030_TWG/1st_Education_2030_TWG_Mtg/SEAMEO_-_TWG_meeting_Feb2016.pdf
- Weitz, N., Carlsen, H., Nilsson, M., & Skånberg, K. (2018). Towards Systemic and Contextual Priority Setting for Implementing the 2030 Agenda. *Sustainability Science*, 13(2), 531-548.