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Equity and equality in learning in Southeast Asia: What do results from large-scale assessments tell us?

GENDER IN FOCUS

POLICY BRIEF

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Chapter 1: Introduction

Gender equity and equality play vital roles in achieving the right to education for all. The commitment of UNESCO Member States, including nations in Southeast Asia, as articulated in the Incheon Declaration and Framework for Action, involves "supporting gender-sensitive policies, planning and learning environments; mainstreaming gender issues in teacher training and curricula; and eliminating gender-based discrimination and violence in schools" (UNESCO, 2016).

Gender equity means that all individuals are treated fairly and without discrimination, regardless of their gender. Gender equity agendas recognize that different genders may have different learning needs, challenges, and circumstances that require tailored approaches to ensure fairness and equality in learning outcomes. Achieving gender equality involves acknowledging and addressing societal norms, stereotypes, and systemic barriers that contribute to gender-based discrimination and imbalance.

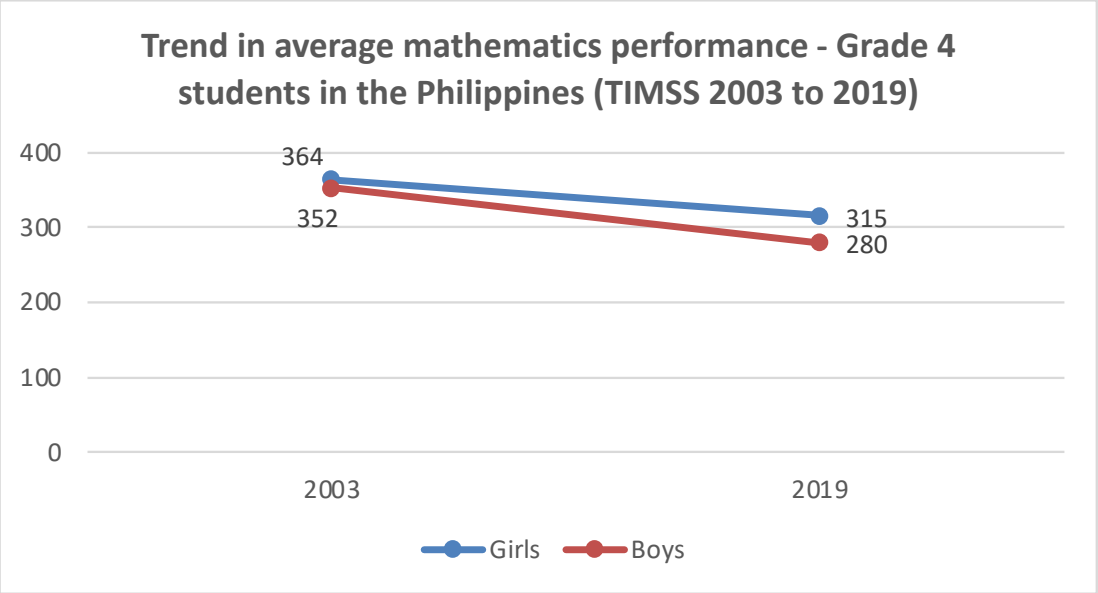
This policy brief investigates gender disparities in learning outcomes and the factors contributing to these disparities as identified in large-scale assessment data in Southeast Asia. It additionally provides a set of recommendations aimed at enhancing equitable student learning outcomes while advocating for comprehensive support of gender-based interventions within educational quality initiatives, spanning both systemic and school-level support. The findings presented in this brief are drawn from large-scale assessment (LSA) datasets and secondary analysis of these sources. For more detailed information regarding the large-scale assessments in Southeast Asia, please refer to the appendix section.

Chapter 2: Girls' and boys' learning outcomes in mathematics and science

Learning outcomes at the primary education level

Girls tend to outperform boys in mathematics across Southeast Asia. Learning achievements from the SEA-PLM 2019 suggest that girls outperformed boys in Grade 5 mathematics in 3 of the 6 countries (Cambodia, Malaysia, and the Philippines). Similar trends are observed for Southeast Asian Grade 4 students participating in the TIMSS cycles[1]. For example, figure 2.1 illustrates how the average mean scores for girls in mathematics at the Grade 4 level in the Philippines were consistently and statistically significantly higher than boys' mean scores. In the most recent cycle, girls outperformed boys scoring an average of 315 points, while the average score for the boys was 280 points (Mullis et al., 2020).

Figure 2.1 Trend in average mathematics scores for boys and girls in Grade 4 students in the Philippines (TIMSS 2003 to 2019)



Note: Notes: The "red" line shows the trend for the boys and "Blue" line shows the trend for the girls in maths. The girls' average scores were significantly higher than boys' average scores.
Source: Created using data from TIMSS, 2019

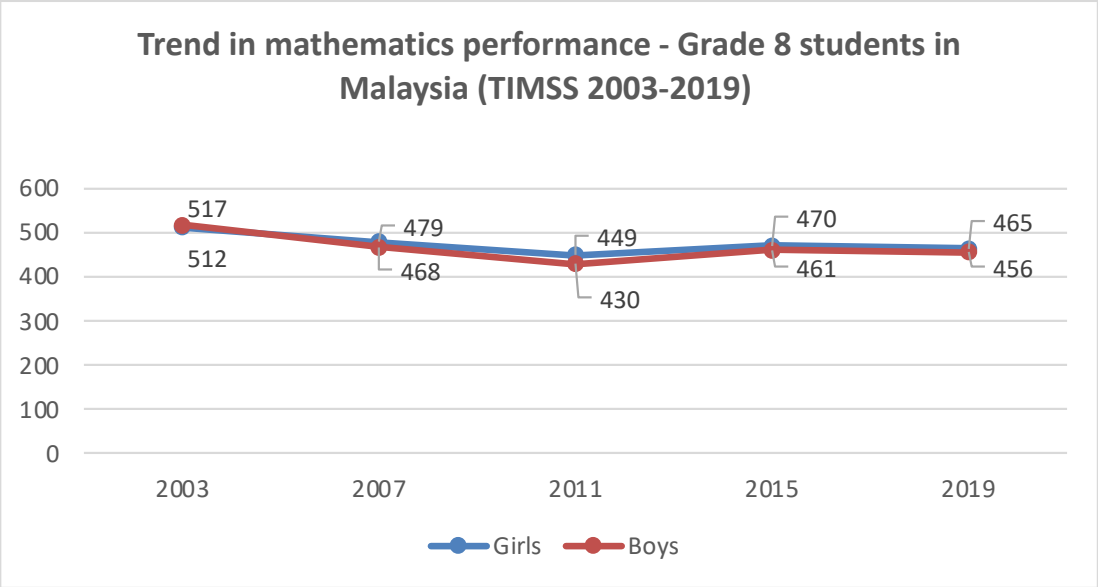
Learning outcomes at the secondary education level

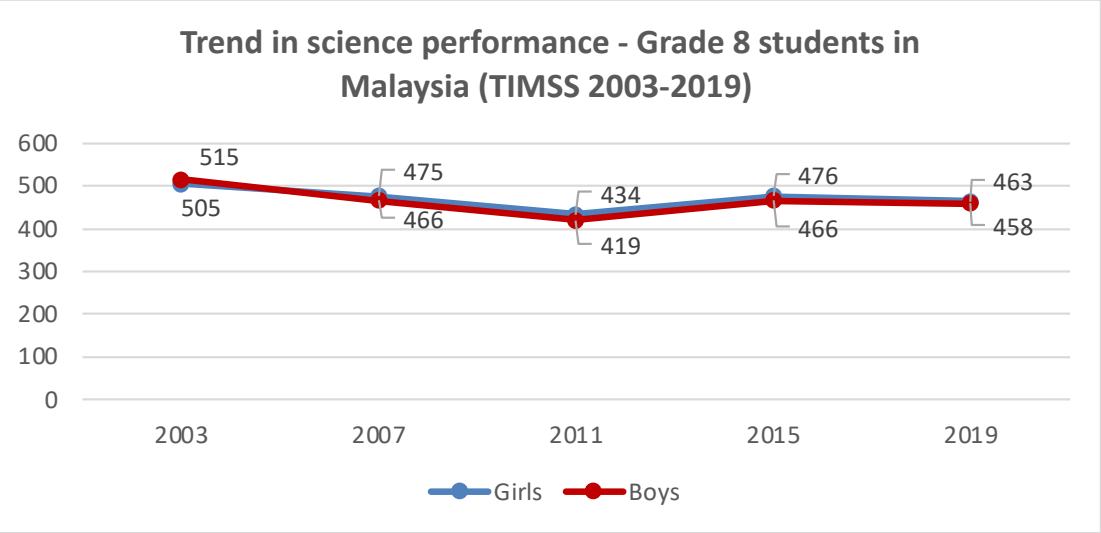
At secondary level, as seen from PISA 2018 data, the 15-year-old girls from the 5 participating Southeast Asian countries (Brunei Darussalam, Indonesia, Malaysia, Philippines, and Thailand) outperformed boys in mathematics and the differences were statistically significant (OECD, 2020b). Only in Singapore the performance difference in mathematics between boys and girls was not statistically significant. The widest gender gaps in mathematics performance, in favour of girls, were observed in Thailand (by 16 points), the Philippines (by 12 points) and Indonesia (by 10 points) (OECD, 2019a). Yet the TIMSS data suggest the performance gap between boys and girls in mathematics is declining for the Grade 8 students in Malaysia throughout TIMSS 2007-2019 cycles (see figure 2.2.).

[1] **Till date 5 Southeast Asian countries have participated in TIMSS. These are Indonesia, Malaysia, Philippines, Singapore, and Thailand.**

In science, the 15-year-old girls performed statistically better than boys in Brunei Darussalam, Malaysia, Singapore and Thailand (OECD, 2019a). The widest gender gap in science performance, in favour of girls, was observed in Thailand (by 22 points). However, the latest TIMSS cycle (2019) showed no significant difference between girls and boys in Grade 8 in science performance in Malaysia (see figure 2.2).

Figure 2.2 Trend in mathematics and science performance amongst Grade 8 students in Malaysia (TIMSS 2003-2019).





Note: The girls' average scores were significantly higher than boys' average scores.
Source: Created using data from TIMSS, 2019

Chapter 3: Girls' and boys' learning outcomes in literacy

Girls tend to outperform boys in reading achievements globally. This trend is observed across learning assessments and across levels of education. Similar trends are observed in Southeast Asia but with a comparatively smaller gap in performance than in other regions of the world. In both the PISA and SEA-PLM large-scale assessments, girls outperformed boys in Grade 5 (SEA-PLM) and at fifteen years old (PISA) in reading.

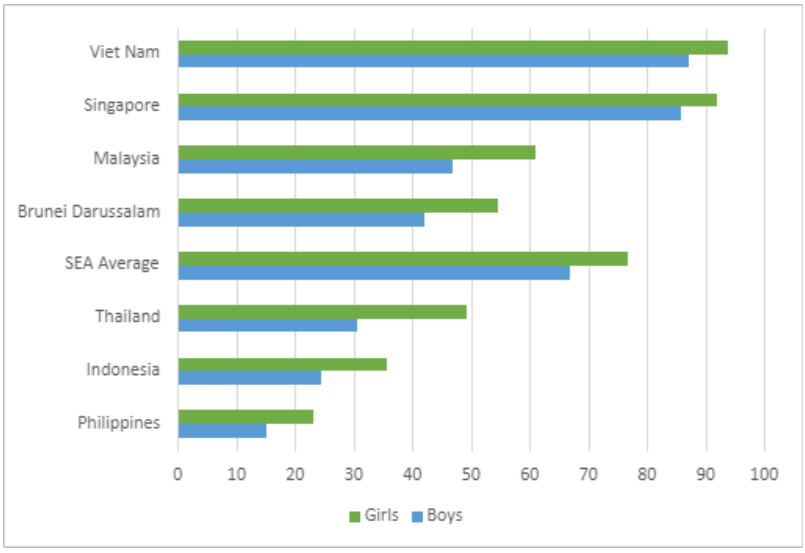
Learning outcomes at primary education level

In all SEA-PLM countries, the percentage of low-performing boys was greater than the percentage of low-performing girls for reading, with the greatest differences occurring in the Philippines (12.2% difference gap between girls and boys) and Cambodia (9.9% difference gap between girls and boys). For high-performing students, girls outnumbered boys. In all SEA-PLM countries, girls outperformed boys, with the largest differences in Malaysia (14.7% difference between girls and boys) and Cambodia (5.7% difference between girls and boys) (SEA-PLM 2019).

Learning outcomes at the secondary education level

At secondary level, one can see that, once again, a greater percentage of boys are low performers in reading across all PISA-participating SEA countries. In particular, less than half (47.4%) of boys in Southeast Asia reached a minimum proficiency level of at least Level 2 (identified as the minimum proficiency standard on the PISA scale, referring to scoring 407.47 points or above on the PISA test) in reading, whereas 58.4% of girls achieved the same standard (see figure 3.1). On average[2], fifteen-year-old girls in Southeast Asia scored 28 points higher in the PISA 2018 reading test than fifteen-year-old boys.

Figure 3.1: 15-year-old students achieving minimum proficiency in reading (at least Level 2 and above) in PISA 2018 by gender, %



Source: OECD, PISA 2018 Database, Table II.B1.7.2

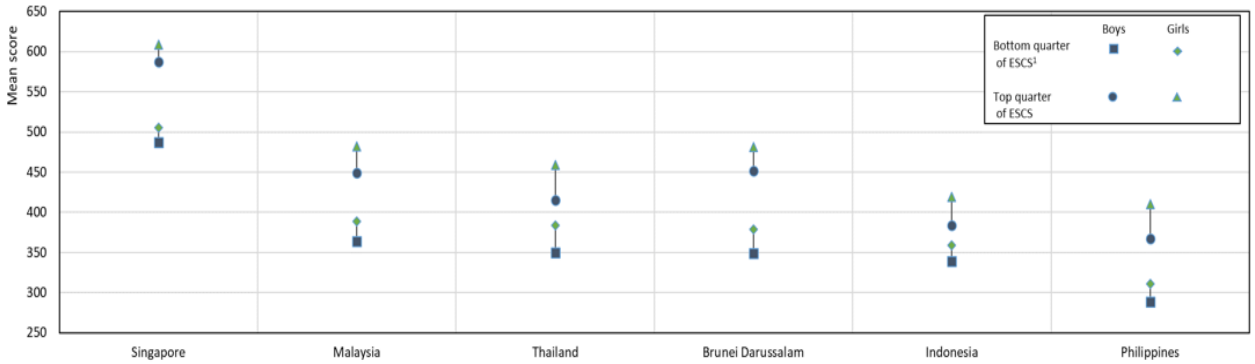
[2] **Average weighted by country**

While we are not able to compare previous performance of SEA-PLM students (the assessment was first implemented in 2019), PISA can provide useful data on how these performance gaps have remained consistent. Between 2009 and 2018, the gender difference remained stable in favour of girls, despite experiencing a significant drop in performance between 2009 and 2015. For example, in Indonesia and Thailand, both boys and girls experienced a significant dip in performance during this period, but girls' performance declined at a greater rate. In Indonesia, boys performing below minimum proficiency (Level 2) increased by 10.1%, while girls increased by 22.8%. Thailand experienced similar losses, with boys performing below Level 2 increasing by 14% and girls increasing by 17.6%.

Chapter 4: Gender and students' socio-economic background and learning outcomes

In general, students from more disadvantaged SES backgrounds tend to perform lower than their peers from more advantaged backgrounds. This is found in both PISA 2018 and SEA-PLM 2019. However, the effects of SES on score performance between boys and girls vary. In some cases, gender gaps increased as SES status declined, with girls from low SES backgrounds outperforming boys from similar backgrounds at greater rates (SEA-PLM 2019). In other cases, the gap in performance between girls and boys remained the same across the socio-economic distribution. Across both assessments, boys from disadvantaged socio-economic backgrounds performed the lowest of any group, with boys from the lowest socio-economic background representing the highest proportion of low achievers in reading (OECD 2019; SEA-PLM 2019).

Figure 4.1: 15-year-old students' reading performance by gender and socio-economic status in PISA 2018, mean score



Note: ESCS refers to the PISA index of economic, social and cultural status. All differences between girls and boys are statistically significant.
Source: OECD, PISA 2018 Database, Table II.B1.7.43

Chapter 5: Home and school factors related to gender disparities in learning outcomes

5.1 Home and school factors related to gender disparities in learning outcomes

A path model was developed for understanding the relationships of the various home and school level factors and their influences on Grade 5 mathematics performance in SEA-PLM 2019 and differences by gender[3]. The resulting model explained between one quarter and more than half of the differences in mathematics performance between students in the six countries participating in SEA-PLM.

Further analysis of student and parent data from SEA-PLM 2019 shows the following relationships between gender and the key factors influencing learning (see table 5.1). Overall, the effects suggest that across most of the factors there are significant gender differences in favour of girls (indicated by the negative effect signs while a gender difference in favour of boys is shown by positive effect signs). The two factors that favour the boys are in fact negatively related to their mathematics achievement.

Table 5.1 Direct effects from gender on factors influencing learning in the path model for all participating countries

Factors influencing learning	Cambodia	Laos	Myanmar	Malaysia	Philippines	Viet Nam	Favours Girls/ Boys
Parental attitudes to homework and learning	-.28	-.16	-.25	-.07	-.26	…	Girls
Activities outside school – Outside the house	.22	.16	…	.33	…	.15	Boys
Activities outside school – Inside the house	-.36	-.12	-.17	-.44	-.16	-.29	Girls
Grade repeti-tion	.05	.04	.04	…	.07	.04	Boys
Learning time at school – mathematic	-.10	…	-.09	…	-.11	…	Girls
Teaching absenteeism	-.17	…	-.10	…	-.11	-.09	Girls
Teaching quality in mathematic	-.03	…	-.13	-.08	…	…	Girls

Source: Authors own calculations using data from UNICEF & SEAMEO, 2020

[3] **Using structural equation modelling (SEM) and the partial least square (PLS) approach**

Several key findings can be drawn from the above direct effects from gender to the factors influencing learning which are also supported in some instances by data collected from other LSAs.

Parental attitude and support

Girls in the 6 participating ASEAN countries are more likely than boys to discuss learning and schoolwork with their parents. This can contribute to further improvements in their academic achievement (UNICEF & SEAMEO, 2021).

Household responsibilities

A notable aspect of students' experiences in the region has been household responsibilities. When polled on the levels of house chores, farm work, commercial activities, and physical work, gender differences existed between type of task and frequency. In all SEA-PLM countries, girls reported higher rates of performing household chores than boys. Conversely, boys reported higher rates of farm work and physical work than girls in most of these countries (UNICEF & SEAMEO, 2021). Although it can be thought that these tasks detract from students' studying time, the data find this to be untrue. In most countries, these activities had a negligible effect on student performance. In fact, in Cambodia, it was found that self-reported rates of household chores had a positive relationship with girls' scores (UNICEF & SEAMEO, 2021).

School experience (truancy, lateness, grade repetition)

From the first years of schooling, boys and girls report similar access to pre-primary, with all SEA-PLM countries except Myanmar and Vietnam reporting a similar likelihood of at least one year of pre-primary education (UNICEF & SEAMEO, 2021). In Myanmar and Vietnam, boys reported a greater likelihood of attending at least 1 year of pre-primary. This relative equality was reflected in measures of readiness in reading and mathematics before primary school, in which there were no significant differences observed between genders in feelings of readiness (defined as children being able to complete 10 or more early language and mathematical tasks before entering school, as reported by their parents) (UNICEF & SEAMEO, 2021).

Beyond pre-primary, the experiences of boys and girls begin to diverge. Boys overwhelmingly report higher rates of truancy and lateness. In Southeast Asia, this difference is particularly stark. When asked about missing school, 22.9% of boys reported skipping a full day of school in the two weeks leading to the PISA test. On the other hand, girls in Southeast Asia reported an average of 15.5%, which is over 4 percentage points lower than the OECD average (OECD, 2019b). This indicates that girls are less likely to skip school in Southeast Asia than in other regions.

When in the classroom, girls in the 6 SEA-PLM countries are more concerned about classroom quality and are more sensitive to issues such as teacher absenteeism. When asked

if students had repeated grades, boys in all SEA-PLM countries were more likely to indicate that they had repeated at least one year, except for Malaysia, where grade repetition is nearly non-existent (UNICEF & SEAMEO, 2021).

5.2 Attitudes and stereotypes around mathematics and science

Differences in attitudes towards mathematics and science

Several studies have confirmed that girls in general tend to report higher levels of 'mathematics anxiety' even when they perform at higher levels compared to boys in their class (Voyer & Voyer, 2014; Martín-Puga et al., 2022; Primi et al., 2014; Sokolowski et al., 2019; Vos et al., 2023). Others have found this anxiety to be related to their cultural and social views around gender stereotypes (Beilock et al., 2007; Devine et al., 2012; Rossi et al., 2022; Justicia-Galiano et al., 2023), which are the attitudes and beliefs of individuals based on their gender which can interact with their personalities, emotions, cognition, and behaviours (Ellemers, 2018). Such stereotypes negatively impact girls' confidence and their perceived ability. It is now widely acknowledged that girls' confidence and self-concept in mathematics is a major decisive factor for the selection of post school science-based courses (Lin et al., 2018; Watt et al., 2017; Saß & Kampa, 2019). In fact, even when girls outperform boys in mathematics, or have higher interest in STEM-related subjects at school, having low self-confidence can potentially discourage them from choosing a career in a STEM-related field (Sax et al., 2015; Holmes et al., 2018).

Differences in liking/enjoyment of mathematics and science

Studies from the high-income Western countries have established that girls express lower levels of enjoyment of mathematics and science than boys (Nagy et al., 2008; Riegle-Crumb et al., 2011), while others have confirmed that such differences do not emerge in all countries and contexts, suggesting that education systems can influence students' intrinsic valuing of mathematics-related subjects (Guo et al., 2015; Watt et al., 2012; Leung, 2006). There is also some evidence that suggests that girls, more so than boys, tend to become disengaged in mathematics and science during the early secondary years of schooling (Plenty & Heubeck, 2013; Potvin et al., 2018; 2020).

Differences in teachers' perceptions and attitudes

There are numerous studies that show how social support systems, including teachers, parents and peers can have significant influence on girls' school attitudes and confidence. Yet the same does not seem to do much for boys, suggesting the key role policies around building social support can play in improving girls' learning and achievement (Rueger et al., 2010; Roorda et al., 2017; Chen et al., 2023).

Gendered career expectations

While the global career data suggests a decline in girls' enrolments and participation in science, technology, engineering, or mathematics (STEM) related careers (Marginson et al., 2013; Holmes et al., 2018), this decline has been linked to the gaps in students' competence

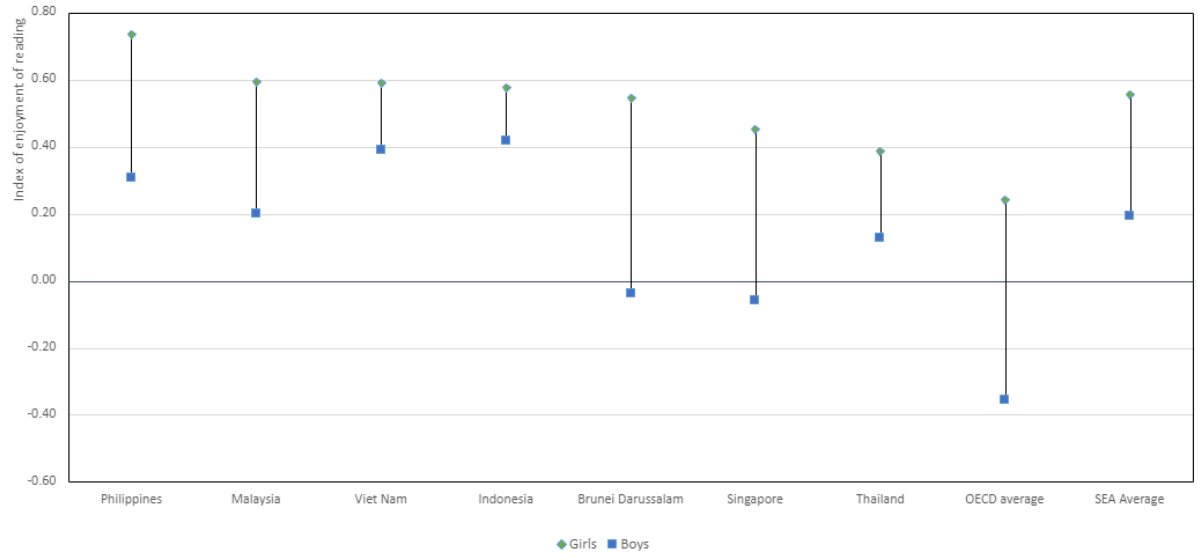
and confidence in mathematics, the two crucial elements for being successful in a STEM-related job (Holmes et al., 2018; Jeffries et al., 2020). Studies have also confirmed that secondary school students who are from the highest mathematics achievement quartile are more likely to work in a STEM-related job (Anlezark et al., 2008). On the other hand, students affected by 'mathematics anxiety' are likely to stay away from mathematics-related courses during the secondary school years and unlikely to select STEM-related professions (Ashcraft, 2002; Beilock & Maloney, 2015; Ahmed, 2018; Holmes et al., 2018; Gabriel et al., 2020; Buckley & Sullivan, 2021; Edwards et al., 2023). This issue is particularly critical as it feeds into the gap in girls' participation in STEM-related jobs.

5.3 Attitudes and stereotypes around reading

Attitudes towards reading

Attitudes towards reading play an important role in reading performance. For example, girls may be more socialized to read, whereas boys may be socialized to pursue other entertainment activities (OECD, 2018; Auxler et al., 2021). As a result of this socialization, enjoyment and attitudes towards reading can be affected. This was shown in PISA 2018, where students' attitudes towards reading and learning were surveyed. In PISA's Index of Enjoyment of Reading, students were asked for their level of agreement with several statements. These statements included "I read only if I have to", "Reading is one of my favourite hobbies", "For me, reading is a waste of time", and "I read only to get information that I need." Across all PISA-participating SEA countries, girls overwhelmingly agreed with statements demonstrating a positive attitude towards reading. On the other hand, boys generally agreed more to statements demonstrating a negative attitude towards reading (see figure 5.3)

Figure 5.3 Gender gap in enjoyment of reading in PISA 2018



Source: OECD, PISA 2018 Database, Table II.B1.8.1.

These attitudes persist through reading habits, where girls display a much higher frequency of reading for enjoyment. For all SEA countries where PISA data is available, on average,

16% of girls indicated that they read more than two hours a day, whereas only 7% of boys indicated the same. Furthermore, an average of 58.7% of boys indicated that they "don't read" or "read less than 30 minutes a day", whereas the girls' average was much lower at 40.7% (OECD, 2019a).

Perception of reading competence

In the PISA's Index of Perceived Competence in Reading, girls were much more likely than boys to agree with statements such as "I am a good reader", "I am able to understand difficult texts", and "I read fluently." Moreover, in the Index of perceived difficulty in reading, which assesses statements such as "I have always had difficulty with reading", "I have to read a text several times before completely understanding it", and "I find it difficult to answer questions about a text", boys scored higher than girls across nearly all SEA countries (OECD, 2019a).

Chapter 6: Promoting gender equity through teaching, learning, and family support

Efforts to promote gender equity in learning in Southeast Asia require a multifaceted approach that considers the region's diversity while addressing common challenges. This involves collaboration between governments, civil society organizations and international agencies, but also, shared investment in and support for students within school communities. Longitudinal surveys serve as invaluable tools to investigate how observed trends play out in the future. Consequently, it becomes imperative to consistently monitor gender equity over time, underscoring the significance of well-crafted research designs that enable accurate measurements of trends. By addressing barriers to students' learning and promoting equal opportunities for all, the region can work towards gender equality.

Address sociocultural norms that limit children's career aspirations and learning opportunities.

Traditional gender roles and stereotypes persist in Southeast Asian societies, influencing expectations around students' educational and work opportunities. This can lead to limiting career prospects for all genders. Addressing these norms is essential for promoting gender equity in education.

One such example of addressing this issue is gender equality campaigns. Starting in India, the Gender Equity Movement in Schools (GEMS) program from the International Center for Research on Women (ICRW) offers a school-based initiative focused on promoting equity by encouraging equal relationships between girls and boys, examining the social norms that define men's and women's roles, and questioning the use of violence (ICRW, 2022). Through participatory methodologies such as role plays, games, debates, and discussions, students dismantle harmful gender-based ideas. Following success in India, this program has since expanded to Bangladesh, the Philippines, and Vietnam. In Vietnam, GEMS has been scaled to 20 schools in DaNang Province, in collaboration with the government of Vietnam and technical support from ICRW.

In addition to overall gender equality campaigns, some initiatives are targeting specific attitudes and biases that boys and girls face in literacy and STEM Education. Several of these initiatives have been made possible through partnerships with the private sector. For example, UNESCO has partnered with the L'Oreal Groupe to promote female representation in science through the L'Oreal-UNESCO For Women in Science Programme. This programme presents international awards to five outstanding women scientists from five regions of the world annually. At the national level, for instance, the L'Oreal Thailand's 'For Women in Science' has been awarding 250,000 Thai Baht grants to Thai women researchers in biological sciences and physical sciences each year since 1997. Through these grants, young girls can see examples of successful female scientists, thereby building confidence in their abilities and resulting in improved learning outcomes.

In the United Kingdom, the National Literacy Trust collaborated with the Premier League to produce the Premier League Reading Stars (PRLS) programme. This programme aims to address gaps in literacy skills through utilizing football role models as reading advocates. To implement this programme, teachers and school librarians engaged children with low attainment and engagement in reading and writing, 80% of whom were boys. Through this 10-week course, participating students displayed improved reading confidence and increased autonomy (Pabion, 2015). This initiative is one of the few examples of countries with significant gaps in reading performance utilizing programmes that target boys' reading skills (UNESCO, 2022).

Enhance teachers' training on gender responsive teaching and learning.

Teachers play a pivotal role in promoting equality in learning outcomes. Moreover, teachers' biases can significantly impact student learning (UNESCO, 2017a). For these reasons, teachers should be trained in gender-responsive pedagogy. As such, it is imperative to provide them with the necessary training and resources to effectively implement gender responsive teaching and learning strategies.

In Cambodia, Myanmar, Nepal, Sri Lanka, and Uzbekistan, UNESCO has implemented its "Enhancing Girls' and Women's Right to Quality Education through Gender Sensitive Policymaking, Teacher Development and Pedagogy in South, Southeast and Central Asia" initiative. Through this multi-year project, partner organizations aim to assess and improve upon the gender responsiveness of teacher education institutions, teaching curricula, textbook policies, and teaching practices (UNESCO, 2017a).

Pursue gender policy mainstreaming and gender sensitive policymaking.

Lao PDR provides a good example for a national gender responsive policy framework. To address significant learning disparities between girls and boys, rural and urban areas, poor and non-poor districts, and among ethnic groups, the national government implemented a national policy focused on inclusive education, broadly defined as removing all barriers to school enrolment and achievement (UNESCO, 2017b). The key tenets of this policy focused on capacity-strengthening, awareness-raising, and inclusion through national and local initiatives. Specifically, organized groups such as the Village Education Development Committee were

strengthened, which in turn collected data on student outcome gaps and used statistics to establish long-term school development plans and yearly school improvement actions.

Moreover, governments can pursue gender mainstreaming in policymaking, which is the process of accessing the implications of all planned actions, including legislation, policies, or programmes, at all levels of the education system (UNESCO, 2019). In this way, gender mainstreaming aims to holistically improve outcomes through adding a gender perspective to all phases of policy development and implementation. Therefore, mainstreaming produces more relevant programming and budget efficiency.

Indonesia has served as a regional leader in this regard, having conducted a review of a decade of gender mainstreaming in the education sector (Notodiputro et al., 2013). The study found that teaching and learning processes were key to improving student outcomes. Successful practices included initiatives to eliminate gender stereotyping and bias in learning materials and the school environment, integration of gender awareness training for principals and teachers, and gender sensitization for school communities. However, the study found that these opportunities were often missed at the national scale, as the initiatives remained highly localized and were often not scaled past pilot programmes. As a result, Indonesia found that they need to prioritize strategic direction for gender mainstreaming, and improve upon technical capacity (UNESCO, 2019).

Support evidence-based approaches to gender inclusion.

Through evidence, policymakers can create relevant, responsive, and sustainable programming. In education, one data collection tool policymakers can utilize is large-scale assessments. International, and regional large-scale assessments provide cross-national data that can be used for benchmarking, improving countries' overall educational system through directive policy, enhancing equity between student groups, and improving teaching and learning practices (UNESCO, 2018). Moreover, when used over time, assessments can capture learning gains or losses, such as those experienced during the COVID pandemic. Additionally, in the Southeast Asia region, governments are the largest sources of funding for these assessments, highlighting the importance of funding prioritization at the national level (UNESCO, 2020).

School leaders, teachers, and families/caregivers play a particularly important role in establishing inclusive learning environments that empower every student. The following table highlights practical ways in which those responsible for directly supporting students can work together to mitigate gender disparities.

School Leaders	Teachers	Caregivers
Promote inclusive practices in the school and in the home, including resource allocation, recognition, and opportunity.	Encourage active and equal participation of all gender groups in learning tasks.	Give children equal responsibilities (including household duties) at home and encourage active participation in play, and learning.
Invest in resources that are not associated with gender and that are appropriate for all learners.	Allocate resources equally within the classroom to students of all genders.	Buy and give resources to children equally and not based on their gender no matter in which stage of development they are.
Engage caregivers, teachers, and community members in conversations about education pathways for students based on their abilities, interests, and performance and not on their gender.	Encourage students and their families to identify future education and work pathways based on the students' abilities, interests, and performance.	Encourage your child to think about their future work and study based on abilities, interest, and skill, and not gender.
Invest in professional learning and parent programs that aim to identify and address the development of stereotypes and harmful gender norms.	Reflect on your own ideas around what students should think, say, and do. Talk to your students about gender norms and stereotypes.	Reflect on your own ideas around what children should think, say, and do. Talk to your children about gender norms and stereotypes.
Encourage teachers to give children of different genders equal opportunities to learn about their natural environment, to ask questions, and to connect their learning to real world experiences.	Encourage children of all genders to learn about their natural environment, and encourage children of all genders to ask questions about the world they live in.	Talk to your children, encourage discussion, and ask your children questions about what they are learning and why.
Provide teacher training focused on developing scientific thinking, logic, and spatial reasoning skills. Invest in resources and subject design that encourage scientific thinking and logic, rather than focusing on memorisation. Invest in a wide variety of reading materials and resources.	Provide opportunities for students to develop scientific thinking and logic in the classroom, and promote STEM skills, such as through building, making, and assembling blocks or structures. Be creative with different resources in the classroom. Use resources from the natural environment to foster play and scientific logic (leaves, sticks, rocks, can be used for building, making, and doing).	Encourage your children to build, make, and play. Using natural resources such as sticks, stones, or leaves can be helpful for children to practice counting and building with. Ask your child's teacher for reading materials and resources that can help your children to improve their reading, thinking, and reasoning skills.
Set up 'reading hours' where students are allowed to read non-school books and reading materials related to their personal interests.	Develop learning resources that can be shared with students and used at home.	Encourage your children to read every day, especially different kinds of materials.

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Appendix

International comparative large-scale assessments (LSAs) are designed to gather reliable data and evidence for monitoring learning outcomes across and within countries, as well as for understanding key sociocultural factors which influence students' learning. The availability of these rich international datasets and results of cross-country analyses provides opportunities for exchange on key lessons and education policies across countries and regions. In doing so, LSAs have the capacity to strengthen participating countries' education systems by supporting their policy reform and improving teaching and learning.

The most prominent LSAs that that are available to the SEA education systems include the following:

- The Trends in International Mathematics and Science Study (TIMSS) which tests the mathematics and science knowledge of students at Grade 4 and Grade 8.
- The Progress in International Reading Literacy Study (PIRLS) international assessment is designed to measure reading achievement of students at Grade 4.
- The Programme for International Student Assessment (PISA) which assesses 15-year-olds in reading, mathematics and science literacy and capabilities.
- The Southeast Asia Primary Learning Metrics (SEA-PLM), which has been developed for ASEAN countries, in reference to their curricula, and keeping in mind their unique geo-political contexts. The first cycle of SEA-PLM took place in 2019 and the next cycle is planned for 2024.

In the SEA region, some countries have been participating in these LSAs for many years, such as Singapore. While others have participated in several cycles, such as Indonesia, Malaysia, Singapore, Thailand, and Viet Nam. Table 1.1 below provides a full list of the Southeast Asian countries which participated in LSAs during the years 2000 to 2019.

Table 1.1 Southeast Asian countries' participation in large-scale assessments

Countries/ economies	Large-scale assessment (s) in mathematics and/ or science	Cycles
Brunei Darussalam	PISA	PISA 2018
Cambodia	SEA-PLM	PISA-D* 2018; SEA-PLM 2019
Indonesia	PISA, TIMSS, PIRLS	PISA 2000, 2003, 2006, 2009, 2012, 2015, 2018; TIMSS 2003, 2007, 2011, 2015; PIRLS 2006, 2011
Lao PDR	SEA-PLM	SEA-PLM 2019
Malaysia	SEA-PLM; PISA; TIMSS	SEA-PLM 2019; PISA 2009, 2012, 2015, 2018; TIMSS 2003, 2007, 2011, 2015, 2019
Myanmar	SEA-PLM	SEA-PLM 2019
Philippines	SEA-PLM; TIMSS	SEA-PLM 2019; PISA 2018; TIMSS 2003, 2019; EGMA 2015
Singapore	PISA; PIRLS; TIMSS	PISA 2009, 2012, 2015, 2018; PIRLS 2001, 2006, 2011, 2016, 2021; TIMSS 2003, 2007, 2011, 2015, 2019
Thailand	PISA; TIMSS	PISA 2000, 2003, 2006, 2009, 2012, 2015, 2018; TIMSS 2007, 2011, 2015
Timor-Leste	SEA-PLM	SEA-PLM 2024 (planned)
Viet Nam	SEA-PLM; PISA	SEA-PLM 2019; PISA 2012, 2015, 2018

Note: *PISA-D: PISA-D stands for PISA for development. This specialised programme was implemented in 2018 with built-in capacity support tailored for countries new to PISA.

To examine performance differences among younger students in primary education, we have reviewed the SEA-PLM 2019 data and data from the Southeast Asian countries that participated in TIMSS 2019, and PISA 2018. Although the results from the different assessments are not directly comparable, they provide a good overview of gender equity and associated issues in participating countries – in different learning domains and at different stages of schooling.

In SEA-PLM, data were collected from a nationally representative sample of children enrolled in Grade 5 across SEA countries. This population is defined by UNESCO (2012) as 'all children enrolled in the grade that represents 5 years of schooling counting from the first year of ISCED Level 1.' In most cases, the ages of children tested ranged from 9-11 years old. Significantly, 5 years of schooling marks the end of primary schooling for many countries, including Lao PDR and Viet Nam.

Measuring and understanding gender differences in learning requires a comprehensive approach that considers various aspects of the education system, social context, and individual experiences. However, although reliable gender-disaggregated data is essential for identifying disparities and tracking progress, collecting such data in Southeast Asia remains challenging. This is particularly true when monitoring students who are impacted by multiple areas of disadvantage, such as disability or low socioeconomic status.

Despite growing participation in international and regional large-scale assessments (LSAs) in recent years, some countries still face barriers. These barriers include the lack of readiness and resources to conduct digital assessments, difficulties in ensuring accurate sampling of rural and otherwise underrepresented communities, and lack of ability to capture out-of-school youth, as discussed below.

A lack of readiness to conduct digital assessments, as opposed to paper-based assessments mean the data collection, cleaning, and analysis process can become much lengthier and more prone to errors for many countries where the paper-based option is used. For example, Viet Nam undertook PISA in the paper-based version from 2012 to 2018. Cambodia will continue to undertake PISA 2025 using paper-based instruments (OECD, 2020a).

Countries in Southeast Asia often face issues around representative sampling. It has been reported that in the Southeast Asian region, the 15-year-old age cohort represented in PISA 2018 was lower than the average proportion of 15-year-olds covered across the OECD countries (OECD, 2019a; OECD, 2020a). High rates of non-response in the region have been attributed to difficulty of accessing remote and rural populations many of whom live in communities that lack sufficient resources (OECD, 2019a). The usable sample of data may also have an overrepresentation or underrepresentation of girls or boys, potentially impacting the results of analyses. In other words, the analysis is only as "good" as the data collected.

There is also a large population of 'out of school' children in some Southeast Asian countries who are not accounted for in assessments (UNESCO, 2015). Excluding these children means that the average performance of students in those countries is not necessarily an accurate representation of overall ability in the region.

Other limitations include:

1. LSAs do not currently capture gender non-conforming and non-binary youth.
2. There is a lack of data on the impacts of the intersection between gender and other causes of marginalisation (for example, when gender is also associated with ability, ethnicity, religion, language, or sexuality, gender differences can become more nuanced).
3. The data that is captured usually describes participation among boys and girls in formal schooling. Data gaps still exist around non-formal schooling and informal education settings where learning can occur.
4. Beyond school years, it is possible that boys/men may overcome learning gaps when they are entering the workforce and girls may lose their advantage due to socio-cultural factors.