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edited by Sameer Khatiwada, Siwage Dharma Negara and Daniel Suryadarma

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Quality of Basic Education in Southeast Asia
Introduction

Sameer Khatiwada, Siwage Dharma Negara and Daniel Suryadarma

Many countries have been investing heavily in education as part of their strategy to promote future competitiveness. Studies show that education investment contributes to higher economic growth and sustainable long-term development. In fact, education quality is strongly associated with higher economic growth, employment and earnings (Woessmann 2015). More educated individuals have higher living standards, pay more taxes, and invest more in health (Akresh, Halim, and Kleemans 2021). Also, education has intergenerational benefits. More educated mothers gave birth to healthier children (Currie and Moretti 2003). In turn, children of more educated parents complete more years of schooling (Lillard and Willis 1994). Education also raises support for democracy and good governance (Glaeser, Ponzetto, and Shleifer 2007).

As elsewhere in the world, Southeast Asian countries have been significantly investing in education. Government expenditure on education range from 2 to 7 per cent of GDP (Figure 1). As a share of GDP, public spending on education has remained relatively stable in the past decade. This pattern indicates higher nominal spending as these countries have all become more prosperous during the period. Spending on education increased from 1.6 per cent in 2012 to 2.2 per cent in 2018 in Cambodia. Similarly, spending increased from 1.8 per cent of GDP in 2012 to 2.2 per cent in 2020 in Lao PDR; while in Myanmar it increased from 1.6 per cent of GDP in 2012 to 2.1 per cent in 2019. However, only Malaysia and Vietnam spent more on education compared to the average global spending.

This sustained public investment has contributed to increasing school completion. Lower secondary school (Grades 7–9) completion rates have remained consistently high in Singapore and Brunei Darussalam

Sameer Khatiwada is Senior Public Management Economist at the Asian Development Bank, 6 ADB Avenue, Mandaluyong City, 1550 Metro Manila, Philippines; email: skhatiwada@adb.org

Siwage Dharma Negara is Senior Fellow at the ISEAS – Yusof Ishak Institute, 30 Heng Mui Keng Terrace, Singapore 119614; email: siwage_dharma_negara@iseas.edu.sg

Daniel Suryadarma is Research Economist at the Asian Development Bank Institute, Kasumigaseki Building 8F, 3-2-5 Kasumigaseki, Chiyoda-ku, Tokyo 100-6008; email: dsuryadarma@adbi.org

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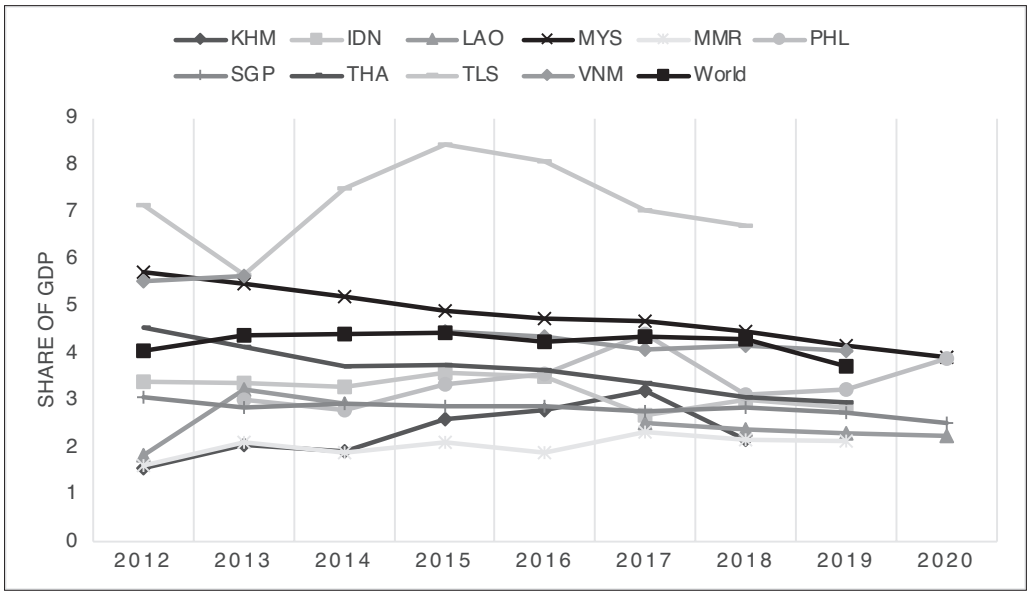
FIGURE 1
Government Expenditure on Education, 2012–20 (Percentage of GDP)



NOTE: 2020 data for Cambodia is not available.
SOURCE: World Development Indicators (https://databank.worldbank.org/source/world-development-indicators).

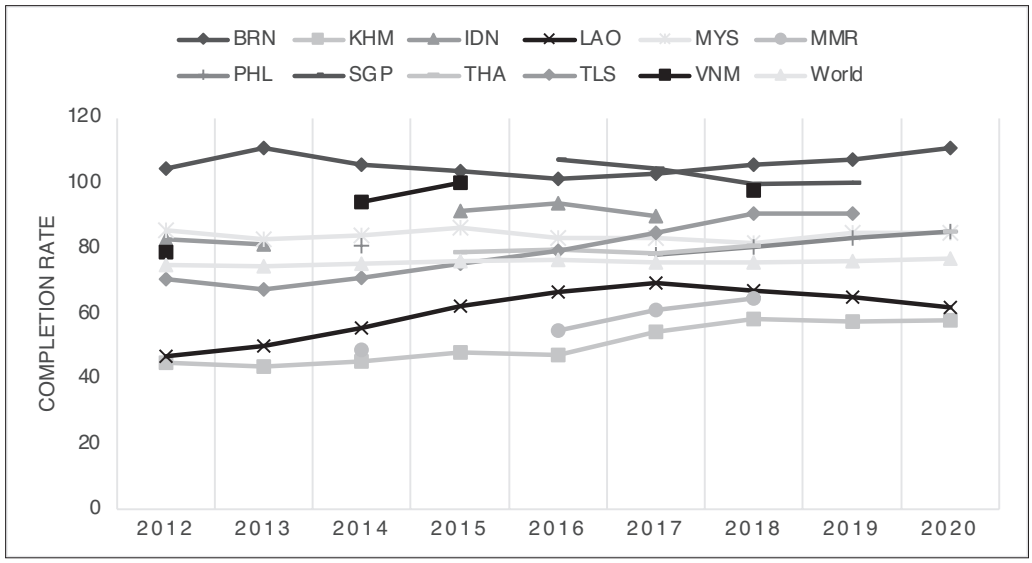
and significantly increased in the other economies (Figure 2). The most significant proportional gains over the past decade were in Lao PDR and Myanmar, followed by Timor Leste and Vietnam. Overall, the relative improvements in lower secondary completion in Southeast Asian economies were faster than the global average.

In contrast to the encouraging and converging results in public education investments and school completion in Southeast Asian countries, however, the gap in learning outcomes remains large (Figure 3). Between 2000 and 2015, learning outcomes in Thailand and Malaysia continued to lag Singapore, with no indication of catching up. However, it is also important to note that this pattern is the case in East Asia and the Pacific. In contrast, learning outcomes in lower-middle income Southeast Asian economies, which in Figure 3 include Indonesia, the Philippines and Vietnam, are improving. There is a clear sign of catching up with Thailand and Malaysia.

However, note that absolute learning levels in many Southeast Asian countries remain low. Indonesia and the Philippines were in the bottom ten countries participating in the 2018 Programme for International Student Assessment (OECD 2019). More than 51 per cent of Indonesian fifteen-year-old students were in the low-achiever category in mathematics, reading and science. The figure was 72 per cent in the Philippines. The 2019 Southeast Asia Primary Learning Metrics surveyed fifth-grade students in Myanmar, Vietnam, Lao PDR, Cambodia, Malaysia and the Philippines (UNICEF and SEAMEO 2020). The survey finds that the learning outcomes between countries differ widely, despite all the students being in fifth grade. For example, 83 per cent of Vietnamese students performed at or above reading grade expectations, while only 8 per cent of Lao PDR students had the same competency.

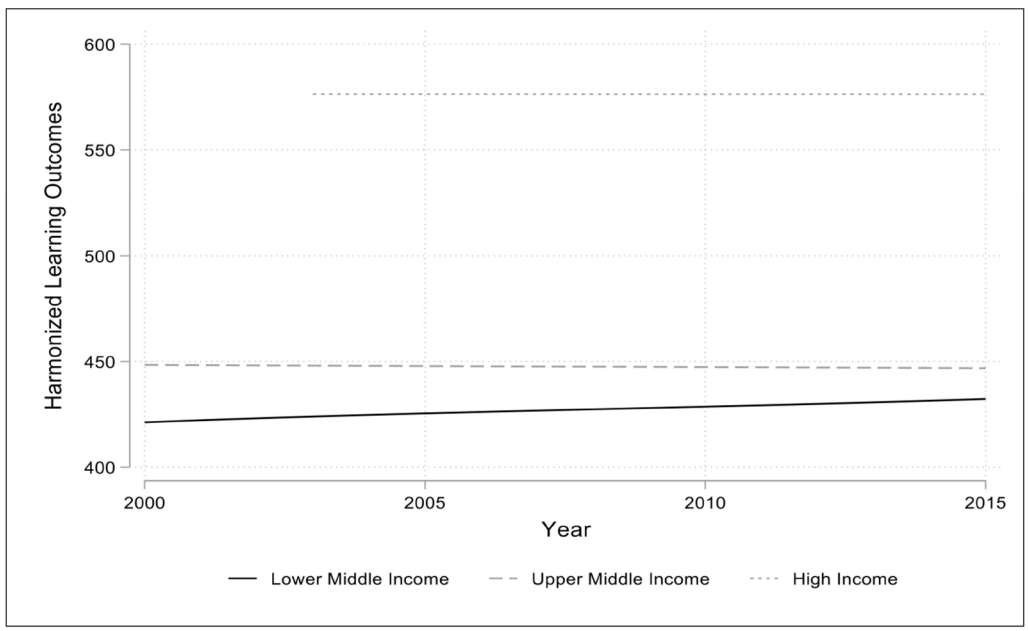
The efforts to improve learning outcomes faced a significant setback during the COVID-19 pandemic. Schools in most countries were closed in March 2020 and began reopening only in late 2021. Gayares-

FIGURE 2
Lower Secondary Completion Rate (Percentage of Relevant Age Group)



SOURCE: World Development Indicators (https://databank.worldbank.org/source/world-development-indicators).

FIGURE 3
Harmonized Learning Outcomes, Secondary Level, 2000–15



NOTES: High income: Singapore; Upper middle income: Malaysia, Thailand; Lower middle income: Indonesia, the Philippines, Vietnam. The learning outcomes are calculated as an unweighted average of reading, mathematics and science scores from international assessments in secondary schools.
SOURCE: Angrist et al. (2021).

Molato et al. (2022) calculate that schools in Southeast Asia were closed for an average of 292 instructional days, equivalent to 80 per cent of instructional days between February 2020 and October 2021. Schools were fully closed for half of this period. During school closures, teaching and learning moved online, interactively or using one-way methods such as television or radio-based instructions. Nevertheless, uneven access to mobile phones and the internet, poorly trained teachers and low parental support meant that the learning experience varied widely (Arsendy et al. 2020). As a result, significant learning losses took place in virtually all countries. On average, students lost six months' worth of learning (Patrinos, Vegas, and Carter-Rau 2022). School dropouts also increased during this period (Gayares-Molato et al. 2022). The World Bank (2022) estimates that learning poverty—the share of children who could not read and understand a simple text by age ten—increased from 57 per cent in 2019 to 70 per cent in 2022. Moreover, the impact of the pandemic on learning outcomes is not yet fully known and will manifest in student performance in the coming years.

There are multidimensional challenges in improving the quality of basic education and ensuring that all students acquire foundational literacy and numeracy skills. This has prompted various education-related reforms, programmes and non-governmental and non-profit organization-supported interventions. There are a few success stories but many more accounts of failure concerning educational reforms in the region. Amidst the situation described above, this special issue reflects the challenges and opportunities that Southeast Asian countries face in improving basic education quality. As a whole, this issue presents the latest empirical research on education in Southeast Asia. There are four country-specific papers, i.e., Indonesia, Malaysia, Thailand and Vietnam, and two regional papers. The six papers examine different areas in education policy using unique research methods.

Bich-Hang Duong and Ni Thi Ha Nguyen evaluate Vietnam's standardization policy. The standardization covers a competency-based curriculum, standardizing the teaching force, and standards-based quality management. They find that, while the suite of policies has significantly improved learning outcomes, challenges remain. One of them is based on overcoming the fundamental tension between standardizing education and students' highly varied family situations and learning needs. The national standard categorizes students based on age, and teachers must implement the same teaching styles across the country using the same textbooks, which could limit the ability of teachers to be creative. Therefore, the authors recommend that education officials provide more authority to school leaders to decide on school-specific policies. The government should also make pre-service teacher education more holistic and allow teachers to innovate their teaching approaches.

Specifically examining the recent developments in basic education in Thailand, Wannaphong Durongkaveroj finds a significant disparity in the quality of education between urban and rural areas. Rural schools are generally small, lack high-quality teachers, and have an insufficient infrastructure. In addition, education accountability and autonomy are lower in rural schools than in urban ones. He states that addressing these challenges is critical for Thailand to escape the middle-income trap.

Focusing on Malaysia, Niaz Asadullah asks how an upper-middle-income country with high Internet coverage designed and implemented a distance learning programme during COVID-19 school closures. He also compares the experience of students from low socio-economic status with more affluent students. He finds that almost half of the students did not receive regular online lessons, and a quarter did not receive any lessons. The low incidence of online lessons for low-income students does not mean that the pattern was due to a lack of digital infrastructure at home. Instead, the data show that the irregularity was related to poor governance and non-compliance by teachers and schools. Therefore, the implementation issues appear to originate from the supply side rather than the demand side.

Masyhur Hilmy's article evaluates *Indonesia Mengajar*, a non-government movement that sends top university graduates to teach in remote primary schools for one year. The paper addresses a broader question of how much improvement in student learning outcomes can happen when highly skilled and

motivated individuals take up teaching. This question is very policy-relevant as low teaching skills are a major constraint to improving education quality in Indonesia. The paper finds that the programme disproportionately benefits weaker students. Higher-quality classroom instruction is the primary driver of the impact. However, the effect on the average score remains small.

The modelling done by Sanchita Basu Das and Badri Narayanan estimates the economic benefits of improving the quality of education, using the Human Development Index as a proxy for quality, on the ASEAN economies. The authors show that, if all Southeast Asian countries achieve the same level of human development as Singapore, significant labour productivity gains will occur. Countries that have the most to gain include Cambodia and Lao PDR.

Finally, Sira Maliphol conducts a systematic review of mobile-assisted language teaching with three objectives: first, to understand what kind of research exists on mobile apps used in language education; second, to understand its integration into the classroom through teacher training and; third, to understand how to integrate mobile-assisted language teaching (MALT) into teaching and learning interactions. The study serves as a specific case of the potential contribution of education technology, focusing on Southeast Asia.

The six articles benefited from the conference organized jointly by the Asian Development Bank Institute, Asian Development Bank and ISEAS – Yusof Ishak Institute held on September 2021 in Singapore (https://www.adb.org/news/events/improving-quality-basic-education-southeast-asia).

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Vietnam's Basic Education Quality in the Wake of Standardization Policy and National Curriculum Reform

Bich-Hang Duong and Ni Thi Ha Nguyen

Vietnam's education development has been characterized as a success with impressive achievements in school enrolment and international standardized tests. The country's outstanding performance is perceived to result from multiple factors such as purposeful policy, high levels of accountability and quality teaching. Among the recent policy changes for education quality enhancement, the adoption of the competency-based curriculum and professional standards for teachers is of heightened importance that has been observed in Vietnam's current reform. This paper seeks an updated understanding of and explanations for the sector's recent performance in terms of education quality. The study focuses on policy efforts and actual changes in the curriculum, teacher management and school-level standards management that aim to improve the quality of basic education. Drawing on a critical analysis of national policy, education reports and the related literature, this study highlights important developments and multiple challenges Vietnam experiences in implementing the standardization policy. Relevant implications for educational policy and practice in Vietnam and other countries will also be discussed.

Keywords: Basic education; education quality; standardization policy; education reform; Vietnam.

1. Introduction

Countries globally have implemented various reform policies to improve their education. Compulsory in most education systems, basic education receives significant attention from the governments in terms of access and quality. As a lower middle-income country, Vietnam's education development has been portrayed

Bich-Hang Duong is a postdoctoral scholar at the Office of Engagement, Arizona State University, 1000 S. Forest Mall, Tempe, AZ 85287, USA; email: hbduong@asu.edu

Ni Thi Ha Nguyen is a scholar holding a PhD in Education from University of Leeds, Woodhouse Lane, Leeds, LS2 9JT, UK; email: edntthn@leeds.ac.uk; nguyenhani@yahoo.com

as a success story with impressive achievements in school enrolment and international standardized tests (Dang and Glewwe 2018; Parandekar and Sedmik 2016). The country's outstanding performance arguably results from multiple factors, including purposeful policy, high levels of accountability, quality teaching and school leadership (McAleavy et al. 2018). Among recent policy changes for quality enhancement of its general education, the adoption of the competency-based curriculum and professional standards for teachers is of heightened importance that has been observed in Vietnam's current education reform. However, little has been known about the process of implementing the standardization policy and the challenges Vietnam continues to address in its efforts to achieve a quality education.

This paper seeks to gain an updated understanding of Vietnam's basic education quality through critical analysis and reflection on issues around the standardization of the curriculum and the teaching workforce in Vietnam. The paper draws on a thematic, critical analysis of government documents, national curricula, materials for teacher training and education reports, in addition to a review of academic literature and relevant media coverage. Focusing on the process of policy implementation, we demonstrate that Vietnam still struggles to enhance its education quality due to the multiple challenges it faces. This study sheds light on the complex process of implementing policies for enhancing education quality in low- and middle-income countries like Vietnam. The paper begins with an overview of Vietnam's education system and renewed policy commitments to improving the quality of its basic education. After reviewing policy initiatives to improve the quality of basic education, we analyse and discuss major changes and difficulties associated with the implementation of the standardization policy. Finally, we suggest implications for policy and practice related to standardization, which are relevant to Vietnam and other countries with similar socio-economic conditions.

2. An Overview of Vietnam's Education System and Efforts to Improve Education Quality

Vietnam education is a centralized system, with the Ministry of Education and Training overseeing most technical educational matters. Its twelve-grade school system has three levels: primary education, lower secondary and upper secondary education. According to UNESCO's International Standard Classification of Education (2011), basic education in Vietnam consists of primary education (Grades 1–5) and lower secondary education (Grades 6–9). With a growing population of 96 million people, more than half of whom are under the age of thirty-five, Vietnam has paid much attention to developing human capital to promote economic growth as part of the national modernization and industrialization project. The country has consistently committed to allocating 20 per cent of the state budget for public education—higher than the average investment of most neighbouring countries (MOET 2017).

Despite its modest position as a lower-middle-income country, Vietnam has been known for its remarkable achievements in education. According to Dang and Glewwe (2018), the country's school enrolment rates are close to 100 per cent at both the primary and lower secondary levels. The completed years of schooling are also high in comparison with other countries with similar GDPs. The literacy rates in Vietnam have also been consistently high, at around 96 per cent in the last several years. Particularly, Vietnam has been considered a high performer in international standardized tests such as the OECD's PISA, compared to many other countries at its level of income (Thien et al. 2016; Dang et al. 2021; Asadullah, Perera, and Xiao 2020).

Several research studies have attempted to explain Vietnam's educational success around learning. Based on statistical analysis, Dang et al. (2021) indicate that, on the 2012 and 2015 PISA assessments, Vietnam is a significant positive outlier conditional on its income. Yet, the authors suggest that Vietnam's contemporary outlier status can be explained little by the observable characteristics of participating students, their households and schools. Meanwhile, Asadullah, Perera, and Xiao (2020) argue that cultural factors, such as pro-learning attitudes, parental commitment and aspirations, could better explain Vietnam's

surprising PISA performance. A mixed-methods study conducted by McAleavy et al. (2018) identifies five factors to understand Vietnam's achievements in education. These factors include purposeful policy, high levels of accountability, quality teaching and school leadership. From the perspectives of educational sociology and political economy, London (2021) argues that Vietnam's education performance should be interpreted in the context in which the education system is embedded and enmeshed with various social, institutional and normative features of its social environment. Among factors contributing to Vietnam's successes in learning, he stresses the importance of both the Communist Party of Vietnam's (CPV) political commitment and public engagement in education.

Despite different perspectives, many scholars concur that the government's prioritization of education and purposeful policies have played a critical role in driving education reform in Vietnam. Regarding this notion, there are two points to note. First, it is observed that Vietnam has increasingly tended to the quality of education when most of its universalization of education goals has been achieved. There are various definitions of quality in education in the international literature. For example, in the context of higher education, quality can be conceptualized as an exception, as perfection, fitness for purpose, value for money and as transformative (Harvey and Green 1993). Drawing on the social justice and capability approaches to defining education quality, Tikly and Barrett (2013) attempt to bring the concept of education quality closer to the notion of human development. In Vietnam, as will be explained in detail in the next section, there is a tendency to adopt the idea of quality as "fitness for purpose". Such an approach to quality assurance initially applied in Vietnam's higher education sector is now gaining more attention in school education.

Second, given the distinct political features in Vietnam,[1] policy development and implementation embody a strong commitment to political will. Vietnam has espoused policy strategies aimed at standardizing the education system to enhance its basic education quality. Nevertheless, far from being linear and straightforward processes, policy development and implementation are often influenced and confounded by multiple complex factors. Meanwhile, limited empirical research has examined the extent to which education policy in Vietnam has achieved its goals, or critically reviewed (un)intended consequences associated with the process of enacting a given policy. As a result, despite political determination and well-intended policies, ample evidence suggests that significant gaps between policy and practice remain. This paper, rather than ambitiously seeking an answer to the question about Vietnam's success, takes the view that it is essential to deeply understand what is happening in the process of striving for quality education. Along these lines, we believe that policy is a process (Ball 1994; Braun, Maguire, and Ball 2010). Policy development and enactment need to be informed by frequent evaluation and reflection to generate as few unintended consequences as possible. The following section continues to review the context in which standardization approaches take shape in Vietnam, and how the related policies are developed and put into practice to improve the quality of basic education.

3. Improving Education Quality through Standardization Policies

Since the standards movement began in the late 1980s, the adoption of standards has been emphasized to enhance the quality and efficiency of education. The recent decades have seen a growing movement towards quality and standards in education in many countries (OECD 1995; Sahlberg 2011), and Vietnam is no exception. What has been observed in Vietnam's education policies and practices (CPV 2013; MOET 2018b, 2018c; World Bank 2016) fits into two new major directions in "policy borrowing" (Steiner-Khamsi 2016). The first is the standardization movement in educational systems, and the second is the global spread of reform packages such as quality assurance in higher education or standards-based education reform in schools.

Standardization spurred by the standards movement emerged as a critical component of education reform efforts. The pursuit of standards is intended for all students to meet performance standards in education and provide them with adequate opportunities and resources to achieve these standards. It aims at raising the level of academic attainment across national populations through standards settings (OECD 1995). In this regard, implementation of standards often requires the development of curriculum, teaching force and educational management to be aligned with the pre-set standards.

Vietnam has sought to raise the education quality by following a policy of standardizing the education system. This policy is framed by the CPV's Resolution 29, issued in 2013, which set the stage for the "Fundamental and Comprehensive Reform of Education and Training" nationally (hereafter referred to as the comprehensive education reform). This reform constitutes a political and legislative framework for a period of substantial change to Vietnam's education in order to "meet the requirements of industrialization and modernization in the socialism-oriented market economy and international integration" (CPV 2013). The implementation of standardization policies to revamp the education system involves the introduction of a competency-based curriculum, the adoption of professional standards for teachers and school leaders, and standards-based quality management in school. At the heart of these policies is the idea of enhancing the education quality associated with standards.

Consistent with the CPV's Resolution 29 are two significant policies related to standardization in basic education. The first one is the "Reform of the National Curriculum and Textbooks" policy (Vietnam National Assembly 2014), and the second is the "National Standards-Based School Accreditation" policy (MOET 2018a, 2020a). One of the motivations for Vietnam's increasing interest in a standards-based approach to education reform concerns its evolving international partnerships and cooperation. For example, Vietnam's membership in the ASEAN Economic Community (AEC) in 2016 has led to a significant awareness of the demand for a high-quality labour force. The accentuated need to build high-quality human resources to increase the country's competitive edge and satisfy regional and international standards for the labour market results in national qualification frameworks in different aspects of the education system (MOET 2020a; MOLISA 2014). In this light, there is extensive support for quality as fitness for purpose in state agendas and national strategies for human resources development. This conception of quality is demonstrated in government documents related to education, for example:

> The overall objective: By 2020, our country's education will have fundamentally and comprehensively transformed in the direction of standardization, modernization, socialization, democratization and international integration; the quality of education will have been substantially improved (GoV 2012).
>
> Education quality is the fulfilment of the objectives of the educational institution or the educational program, and the requirements of the Education Law in accordance with the needs of using human resources for the socio-economic development of the locality and the whole country (MOET 2012).
>
> Curricula are designed to represent the educational goals, to stipulate standards of knowledge, skills, scope and structure of educational content, methods, and forms of organizing educational activities, and assessing educational results in every subject, every grade or training levels (Education Law 2009, Art. 6).

The promotion of quality as fitness for purpose comes with a consensus about defining quality based on standards. In fact, standards and standardization have been frequent discourses in education policy since the 2010s. Standardization as a policy solution to quality is evident in different components of the education system such as curriculum, and management of resources in education programmes, especially the teaching force both in school and higher education (CPV 2013; GoV 2012; MOET 2009, 2018b). The following sections provide an overview of the standardization policy as reflected in three key initiatives to

enhance the quality of basic education in Vietnam: (i) reforming the curriculum focusing on competency standards, (ii) standardizing the teaching force, and (iii) applying standards-based quality management in school.

3.1 Curriculum Reform: A Transformation from Content-Based to a Competency-Based Curriculum

Many scholars noted the central role of international organizations such as the OECD, UNESCO, the World Bank, and the European Union in conceptualizing the notion of competence and integrating competency-based approaches into national curricula across the world (Halász and Michel 2011; Steiner-Khamsi 2016; Takayama 2013; Anderson-Levitt and Gardinier 2021). Our investigation into the literature on curriculum development in Vietnam suggests that the country's endorsement of the competency-based approach took shape in the context of the global education reform movement towards CBE.

The comprehensive education reform project, supported by the World Bank, has facilitated the transformation of the national curriculum over the last decade. The specific objective of this project is to improve the quality of teaching and learning by: (i) implementing the competency-based curriculum and (ii) improving the effectiveness of instruction by developing textbooks aligned with the new curriculum (World Bank 2016).

As for the first objective, the new curriculum, also known as the 2018 National Curriculum, was officially implemented in 2020, after two years of postponement. It aims to develop Vietnamese students' competencies translated into outcome standards. As it states:

> The new National Curriculum is designed to continue to develop the necessary qualities and competencies for an employee, civic awareness and personality, the ability to self-study, lifelong learning awareness, and the ability to choose an occupation suitable to one's capacities and interests, their conditions and circumstances to pursue higher education or vocational education or engage in working life, and the ability to adapt to change in the context of globalization and the new industrial revolution (MOET 2018a).

The new curriculum was developed with an explicit focus on a standards-driven approach. As will be discussed in the later section, this policy was developed in accordance with the global education reform movements towards competency-based approaches. The standards-driven policy shows a marked tendency to evaluate the education provision by considering whether the learning outcomes fit the stated purposes and objectives, ones that should faithfully reflect the CPV and the State's political and philosophical underpinnings.

With regard to the second objective, multiple sets of textbooks have been developed in alignment with the new competency-based curriculum. Over the last two decades, a single set of state-sanctioned textbooks has been used across schools throughout the country (except for private schools, which may develop their own learning materials approved by the MOET). With the roll-out of the new curriculum, local provinces can now decide on the sets of textbooks most relevant to their localities' socio-cultural characteristics and needs. It is hoped that the adoption of multiple textbooks and a competency-based curriculum will usher in a faster shift towards progressive pedagogies such as active learning and student-centred approaches.

3.2 Standardizing the Teaching Force: Professional Standards for Teachers and School Leaders

The effort to improve the teaching force quality strongly engages with the idea of standards-driven education. Teacher professionalization is, in fact, part of the more comprehensive policy initiative to professionalize public servants across all professions. To assure the quality of the teaching profession, the government has applied professional standards for teachers and school leaders; for example, standards for

secondary-level teachers were introduced in 2009. While these standards are mainly aimed at in-service teachers, their scope of application includes stakeholders in pre-service teacher training as they provide a basis for developing training programmes for secondary school teachers (MOET 2009). These standards have recently been replaced with the Professional Standards for Teachers in Primary and Secondary Schools (MOET 2018b). As such, educational institutions across the country are adjusting to a range of standards that are set to redefine the quality of teachers, teacher preparation, and teacher professional development.

3.3 Standards-Based Quality Management in Schools

In the developing quality assurance system in Vietnam, accreditation is regarded as a foundational mechanism for managing the quality of education. By law, "accreditation is the main measure to determine the level of implementation of educational objectives, programs and contents in schools and other educational institutions" (Education Law 2009, Art. 17). In basic education, the Fundamental School Quality Level regulation issued in 2006 establishes minimum standards for physical facilities, school organization and management, teaching materials and teacher support and school-parent linkages for primary students (World Bank 2011).

In 2018, MOET issued three circulars regulating the accreditation of education quality and recognizing the achievement of national standards for kindergartens, primary schools and lower and upper secondary schools. The objectives of accreditation in education are to:

> identify schools that meet the educational goals in each period; make quality improvement plans; maintain and improve the quality of school practices; publicly notify public administrative bodies and society about the quality status of schools; for public administrative bodies agencies to evaluate and grant recognition of schools that gain accreditation" (MOET 2018a).

With the perception that standard-based quality management is part of quality assurance, the educational administrative bodies emphasize an expectation of mutual impact between quality accreditation, quality assurance and quality culture in educational institutions, which is governed by law (MOET 2020a).

4. Reflections on the Implementation of the Standardization Policy

In this section, we discuss the above-presented issues—the new curriculum, teacher professionalization, and quality management at school—in light of the ongoing changes and associated challenges in the implementation of the standardization policy.

4.1 Curriculum: Changes in Progress and Limitations

The competency-based approach to the new curriculum is developed in a way that is aligned with the creation of outcome standards across the grades in both primary and secondary education. Accordingly, schools and teachers across the country are adapting to the new sets of competency standards, replacing the conventional framework believed to be academic content-focused and exam-oriented. Nevertheless, the implementation of the competency-based curriculum with competency standards faces various limitations and challenges, some of which are discussed in the next sections.

4.1.1 A Lack of a Standards-Referenced Data System. One of the benefits of competency-based education (CBE) is the formation of a fully transparent system that can adapt and address the needs of individual students. As such, schools implementing the competency-based curriculum should have adopted some

level of the standards-referenced approach, with instruction, assessment and recording aligned to standards. As information about individual students and their learning relative to standards drives the decisions within a CBE system, gathering standards-based data and analysing them are foundational components of scheduling. Scheduling relies on two sets of student data: (i) grade-level data, which support schools' broader grouping of students into classes, and (ii) specific standards data, which support the placement of individual students (Finn III and Finn 2020).

A major challenge to Vietnam's schools in the shift to CBE is a lack of a standards-referenced data system. The new general curriculum and subject curricula include the descriptions of required competencies. Still, there is an absence of a database regarding the existing proficiency of students with reference to the competencies standards, as well as a concrete plan to develop such a data system in the near future.

Theoretically, if fuelled and ensured by robust data from the formative assessment, a CBE system allows for student progression decisions at the end of the level. Meanwhile, the educational assessment system in Vietnam has gradually transitioned from the assessment of learning outcome to the assessment of student progress and competence development across subjects (VNIES 2021). Unfortunately, assessment has been more regularly used to rank academic achievement and grade advancement rather than improving pedagogies and evaluating the development of students' capacities (Manh and Duong 2021; Nghiem-Hue 2021). Notably, the practice of formative assessment has faced psychological barriers from students, parents and the wider communities. In other words, formative assessment has not yet been used properly to diagnose students' difficulties and promote understanding of learning goals and criteria for competency development.

4.1.2 A Shortage of Resources for Competency-Based Teaching and Learning. The characteristics of CBE set itself a great difference from conventional education models, particularly in terms of enabling individual students to fulfil their potential for competency development. For example, in a CBE environment, students have not only a voice but also choices in the teaching and learning process; thus, student agency should be encouraged to develop. Students also have multiple opportunities and ways to learn specific content at their own pace, and they move on to the next level within a subject area only after they have demonstrated proficiency at the current level (Marzano et al. 2017). CBE also enables students to think beyond the confines of the classroom and understand that what they learn should be applied in their lives beyond school. Adopting a competency-based curriculum, therefore, needs a provision of extensive and suitable resources for schools.

Vietnam embarked on a competency-based curriculum while there was an acute shortage of resources for teaching and learning in a CBE system. In public schools, where 89 per cent of all students in the country attend (MOET 2021), students are grouped and scheduled according to their ages rather than their learning needs and competence. Schools currently operate on a school-year basis, which does not enable students to learn content at their own pace. Moreover, curriculum implementation must comply with the schedules prescribed and supervised by the central and municipal administrative bodies. Thus, students are supposed to advance to higher grades as long as they successfully complete the school year.

In addition, the availability of teaching materials and the quality of the infrastructure in schools, particularly in satellite areas in Vietnam, remains below the desired level despite the substantial improvement in school inputs and teacher training levels in the past years (MOET 2021). A standard class is designed for a maximum of thirty-five in primary schools and forty-five pupils in secondary schools (MOET 2020a). Yet, the large class size due to the shortage of schools is a serious problem in most big cities in Vietnam. For example, in some districts in Hanoi, a class accommodates sixty, even sixty-nine pupils (see Nguyen 2018). This is an enormous obstacle to progressive teaching and learning approaches,

particularly ones that emphasize collaboration and interaction such as student-centred learning (MOET 2018a; World Bank 2016).

4.1.3 Limited Teacher Agency in Relation to Textbooks. Another obstacle to implementing the competency-based curriculum involves the decision-making capacity of teachers who enact the curriculum. Teacher decision-making capacity in relation to changes in policy may be seen as a form of teacher agency or "a response to or reaction against the educational policy, as shaped by the material and social conditions within which teachers work" (Priestley et al. 2012, p. 7; Nguyen and Bui 2016). In this regard, limited teacher agency in Vietnam is considered in terms of the lack of teachers' active involvement in choosing textbooks and the flexible use of learning materials.

As mentioned earlier, under the new "one curriculum, multiple sets of textbooks" policy, schools, in consultation with the provincial People's Committee, can make recommendations on the relevant textbooks to be used (MOET 2020b). Nevertheless, both schools and teachers have not been the final decision-making agents regarding the chosen textbooks. The complex mechanism and limited time in the process have, in effect, hindered schools and teachers from actively participating in the selection of textbooks that they are the ones to use. As a result, many teachers took a formalistic approach to textbook selection (Nguyen 2021), meaning that they were not attentive and serious enough in choosing the textbooks which should be most relevant to their students' needs and characteristics.

The lack of teacher agency has been more evident in the use of textbooks even before the new competency-based curriculum. In fact, it is a deep-rooted tradition in the Vietnamese schooling system that textbooks are viewed as a key input in teaching and learning. In the teaching and learning process, the teacher-student relationship in Vietnam is often characterized by the students' compliance with their teacher who is regarded as "the master of knowledge" (Le 2018; Nguyen et al. 2005; Pham 2008; Saito, Tsukui, and Tanaka 2008; Nguyen 2020). Some studies indicate that, while Vietnamese teachers tend to be receptive to the ideas of progressive educational innovation, many continue to play the role of knowledge transmitters whose teaching practice shows a reproduction of rigidity, conformity and textbook dependency (Le 2018; Nguyen and Hall 2017). This reality reflects the historical centrality of textbooks in Vietnam's education, where teachers are also expected to endorse and inculcate the official ethos. The roll-out of multiple sets of textbooks for the competency-based curriculum has technically put an end to the textbook monopoly. Still, further thinking shifts in developing and using learning materials are critically needed to stimulate the circulation of innovative ideas beyond the deep-seated mainstream doctrines.

4.2 Teacher Professionalization and Professionalism Development

As presented above, Vietnam has focused on teacher professionalization and teacher professionalism to standardize the teaching force. In this respect, the governance and control of teacher education and professional development are most evident in the entry requirements into the teaching profession and the application of standards for in-service teachers.

4.2.1 Teacher Professionalization. The enforcement of professional standards for teachers, on the one hand, is aimed at improving the teaching force's quality. On the other hand, it is to inform the evaluation of the needs for teachers' and school leaders' professional development. The 2018 Professional Standards for teachers, replacing the 2009 version, include higher requirements. The standards for pre-service teacher education have been increased accordingly. As of 2019, almost 100 per cent of teachers met the standards according to the Education Law 2005 and the revised one in 2009. Nevertheless, the increased

standards for pre-service teacher education by the Education Law 2019 have led to a large number of teachers who do not meet the new teacher standards (VNIES 2021).

Notwithstanding the above-mentioned aims, the application of professional standards has been criticized for heavily emphasizing qualification attainment rather than actual performance. There is confusion about MOET's procedure for collecting teachers' evaluation data, which teachers are supposed to fulfil and is seen as a redundancy. For example, this reality is reflected by a lower secondary teacher whose opinion is stated in the national press:

> Only teachers who received formal training, graduated from teacher education universities and colleges, passed the official recruitment exam, can stand on the podium, and they are evaluated every year, so there is no need for a standard evaluation which is very formalistic like the way it is being done. Hopefully, MOET will reconsider whether it is necessary to use the professional standards to evaluate teachers. Reducing administrative procedures or reducing records and unnecessary pressure is also one of the solutions for improving the quality of teaching substantially (Nguyen 2021).

From the teachers' perspective, self-evaluation against the professional standards on a yearly basis involved a large amount of bureaucratic paperwork. As a result, the repetition of the evaluation processes renders the enforcement of the current standards excessive.

While the qualification standards are a form of licensure statute, the professional standards for teachers serve broader aims. The latter provides the basis for teacher self-evaluation and teacher appraisal. Furthermore, it informs both the governmental administration bodies and teacher education institutions about teacher professional development needs, which is significant for improving the teacher policies (MOET 2018b).

4.2.2 Teacher Professionalism. In an attempt to develop teacher professionalism, MOET set out a strategy to revamp teacher education and professional development in accordance with the new requirements of the comprehensive education reform. Specifically, the multidimensional strategy aims to strengthen the existing system by: (a) providing pre-service teacher education for new teachers, (b) upgrading those who need additional qualifications, (c) providing in-service training programmes that bring teachers to training centres for specific objectives, and (d) providing support and training for teachers and school leaders inside schools and classrooms through continuing professional development (with the support of the World Bank through ETEP—the Enhancing Teacher Education Program 2016–22) (World Bank 2016; VNIES 2021).

Some important insights are emerging from our review of national and institutional regulations on standards for pre-service teacher education programmes.[2] First, a strong emphasis is placed on the teacher's knowledge, skills and professional ethics required for a tightly controlled school curriculum. Yet the expectation that pre-service teacher education should produce newly qualified teachers who are to meet the requirements of schools and society remains vague or over-generic. Second, although teachers are expected to have more autonomy, exemplify critical and creative thinking and be actively involved in knowledge construction, they are at the same time demanded to "have patriotism and a love for socialism, understand and strictly comply with the Communist Party of Vietnam's strategies and undertakings, the State's policies and laws" (MOET 2009). In other words, the ultimate requirement is that a teacher should be an obedient servant of the authorities or dutifully comply with the top-down mandates. Third, pre-service teacher education is not inclusive of some key areas of pedagogical knowledge and skills, including pupil behaviour management and teaching pupils with special education needs and disabilities, pedagogies that have grown in importance in initial teacher education in many countries around the world. These requirements for teachers' capacities are also absent from the latest professional standards for

teachers. Meanwhile, other areas of teacher professionalism, such as classroom behaviour management, application of pedagogical research into teaching, and professional responsibilities towards colleagues, parents and the wider community, are surprisingly not included or not expressed explicitly in the teachers' standards.

These findings suggest that there is a gap in Vietnamese policymakers' and teacher education providers' approaches to teacher professionalism and standards. While the development of teacher standards has shaped the definition of a qualified teacher, the current official approach to quality in education might lead to the need for the redefinition of a highly qualified teacher. Such a knowledge gap might therefore have a negative impact on the enactment process of the standardization policy.

4.3 Standards-Based Quality Management in Schools

Vietnam has increasingly emphasized school accreditation over the past several years by introducing a series of regulations around national standards for schools (see MOET 2018a). Despite increased attention to improving schools' standards, implementing standards-based quality management in Vietnam still encounters some limitations and difficulties. With regard to the policymaking and the practice of quality assurance, for example, there is a critical need for a more independent mechanism of accreditation, in addition to developing professional quality assurance staff, quality culture and internal quality assurance (Nguyen and Hall 2017). More importantly, effective quality management requires a coherent policy stemming from the institution's mission and vision. Middlehurst (1997) argues that external and internal changes require educational institutions, and the system as a whole, to redefine missions, purposes and practice. Quality at schools, therefore, cannot be successfully managed without a clear internal policy decided by those with leadership responsibilities.

Meanwhile, empirical evidence indicates that Vietnamese school leadership has limited autonomy in terms of staff appointment and financial planning, and that they are under close supervision. Specifically, school leaders have considerable in-school power in Vietnamese schools, but there are distinct limits to their autonomy and decision-making. Vietnamese school leaders ensure high accountability, but they are accountable to the political authority, particularly the local People's Committee and the school's own political board, in which the representatives of the Communist Party as members have a significant influence (London 2021; McAleavy et al. 2018).

Efforts to manage standards-based quality, in which quality assurance and accreditation are used as mechanisms for accountability, also lead to a major challenge for Vietnamese schools—creating a school-wide quality culture to enhance quality sustainably. Evidence from the investigation by McAleavy et al. (2018) into the Vietnamese school system confirms that "while there is a role for external accountability, internal accountability systems are also important, including peer review". While Vietnam's educational landscape is characterized by a high level of public engagement in educational issues (London 2021), there should be more active involvement of frontline actors such as school leaders, teachers, and academics in the decision-making and setting of policies and responsibilities. Such involvement also helps mitigate unintended consequences and limitations of top-down approaches to quality management. Increasing school staff's knowledge of educational plans, strategies and objectives, alongside fostering their active role in sharing knowledge of good practices and problems in their work, allow quality culture to be nurtured. Additionally, empowering teachers, administrative staff, and students to make decisions and address problems appropriate to their levels requires a bottom-up approach to quality culture development (Osseo-Asare, Longbottom, and Pieris 2007; Bendermacher et al. 2016).

Finally, to harness the power of multiple stakeholders, community involvement in schools should also be considered. Although many schools have received significant financial support from parents and local communities through the "societalization" (or socialization) policy (see Duong 2015; London 2021),

parents- or community-school partnerships should operate in a more transparent and organized manner. For example, community members and parents may assist teachers with learning activities at school or be involved in the governance of the school (McAleavy et al. 2018). In this way, community and parental involvement can also act as an accountability mechanism that meaningfully enhances schools' quality management.

5. Conclusion and Implications

As of this writing, Vietnam has introduced the standardization policy for approximately ten years. The enactment of this policy has involved considerable changes and developments in the national curriculum, the teaching force and school management. Nevertheless, to our best knowledge, there has not been a rigorous and comprehensive plan for evaluating the new curriculum or the educational reform more broadly. It may be too early to measure the full impact of the standardization policy on quality improvement in Vietnam's basic education; but it is critical to perform continuous review and reflection on the process of implementing the policy. Based on the insights into the development and enactment of Vietnam's standardization policy presented above, we offer implications for educational policy and practice, particularly in countries that pursue the competency-based curriculum and standardization approach to enhancing the quality of basic education.

First, the adoption of CBE needs to be informed by a profound understanding of the foundational components and principles of a CBE system. Many scholars suggest that competencies and assessments are essential components of any successful CBE (Finn and Finn III 2021; Halász and Michel 2011). Thus, curriculum developers at the central and institutional levels need to reconsider the formulation of learning outcome standards in association with the clarification of competencies, and importantly, the strategies to assess students' competencies. The practicalities of implementing the standardization policy in Vietnam also imply the need for a consistent understanding of new constructs related to quality and standards in education, and how they should be re-contextualized to fit into the local education system's goals and needs.

Second, transitioning from a traditional system to a CBE system requires appropriate resources for a learning environment where flexible approaches to curriculum and assessment are encouraged. It is essential to establish a standards-referenced data system based on comprehensive student assessment. This is a necessary condition for effective competency-based curriculum implementation. The standards-referenced approach to assessment provides specific descriptions of levels of learning and evidence of how well individual students achieve the competency standards (see, for example, standards-referenced assessment in Australia in Killen 2014). An equally important matter is the need for regulatory freedom in a CBE system. Such freedom space allows innovative teaching approaches, as well as scheduling and staffing configurations that best meet students' individual needs (ExcelinEd 2016). The curriculum delivery is unlikely to be successful if Vietnamese schools remain age-based classrooms because such a traditional structure does not basically accommodate pace-based learning.

Finally, standards-based school quality management in Vietnam is young as it is currently confined to the accreditation system, which has been introduced in primary schools. It is clear that the Vietnamese government has a purposeful policy for quality improvement through standardization. Yet quality management processes such as quality assurance and accreditation should be based on a coherent internal policy, coupled with a well-developed cultural and psychological component of its quality culture (Kleijnen et al. 2014). Given quality culture is a kind of organizational culture, leaders are central drivers of quality culture development (Bendermacher et al. 2016). With the capacity to influence resource allocation and optimize people and process management, school leadership could be a prerequisite for actually steering and improving the quality of school education.

NOTES

1. For example, see a detailed discussion in London (2021).
2. Our review focused on the 2009 and 2018 Circulars on Professional Standards for Teachers and documents published online on the webpages of three leading teacher education institutions in Vietnam, i.e., Ho Chi Minh City University of Education, Hanoi University of Education, and Thai Nguyen University of Education.

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Recent Developments in Basic Education in Thailand

Issues and Challenges

Wannaphong Durongkaveroj

Over the past few decades, Thailand has made progress in expanding access to basic education, increasing literacy rates and narrowing gaps in school attendance between socio-economic groups. This paper surveys recent developments in Thailand's basic education with an emphasis on the learning outcomes of Thai students, the determinants of such outcomes, and the challenges faced by the basic education system. The study finds that, despite the significant amount of resources spent on education and the fact that the quality of the workforce is crucial for the country's current stage of economic development, students' learning outcomes are low and have not improved significantly in both national and international assessments. The performance of junior secondary school students in the national examinations has declined, especially in Mathematics and Science. While the performance of senior secondary school students has improved slightly over the same period, the mean results for core subjects were less than 50 per cent. This worrying figure is worsened by inequality in education quality across regions since the performance of secondary school students is lower in poorer, remote regions. According to the results of the international assessments, Thai students are performing below the international average in core subjects. This paper argues that such poor learning outcomes are presumably due to two main reasons: (1) differentiated management of small versus large schools and (2) inefficient resource allocation in public spending on education. This is a pivotal period in Thailand's economic development. And substantial reforms are needed to ensure high-quality basic education for all.

Keywords: Basic education; learning outcomes; Thailand

1. Introduction

Despite the sizeable public resources allocated to Thailand's basic education system, academic performance among primary and secondary school students in both national and international assessments remains

Wannaphong Durongkaveroj is a Lecturer in the Faculty of Economics at Ramkhamhaeng University, 282 Ramkhamhaeng Road, Hua Mak, Bangkapi, Bangkok, Thailand 10240; email: wannaphong@ru.ac.th

poor. In fact, it has not improved markedly in the past decade. Over the years, numerous studies have established that this worrying trend is primarily driven by a large disparity in the quality of education between urban and rural areas, which in turn adversely affects other development indicators such as economic growth and income inequality (Lounkaew 2013; Paweenawat and McNown 2014; Lathapipat 2016; Wasi et al. 2019). The slowing economic growth and growing concern about the middle-income trap have spawned debate on equity in basic education among scholars and policymakers. This paper sets out to contribute to the debate by examining academic performance among primary and secondary school students, analysing the forces driving it, and attempting to identify critical challenges for Thailand's basic education system.

In recent decades, access to basic education has expanded remarkably in the country. Even though early studies (e.g., Sirilaksana 1993; Warr 2007) found progress in basic education unsatisfactory because secondary school participation rates were low and did not improve significantly during the late 1980s, this was no longer the case after 2000. Lower secondary enrolment rates increased from 77 per cent in 1995 to 95 per cent in 2020. Upper secondary enrolment rates rose from 41 to 81 per cent in the corresponding years. Primary and secondary school participation rates have also improved significantly, thanks to the first education reform implemented in 1999 and the Constitution, which guarantees equal rights to basic education among Thai citizens. This expansion of Thailand's education is the result of sustained public spending on education. Thailand has consistently allocated a significant share of government expenditure to education each year. In 2020, the government spent about 12 per cent of its budget on basic education.

However, it is unclear whether the substantial investments that Thailand has undertaken in education have led to improved learning outcomes. Data from the 2018 Programme for International Student Assessment (PISA) reveal that Thai students scored lower than the OECD average in Reading, Science and Mathematics. In addition, research over the years has established that large disparities in learning achievement exist between Bangkok and elsewhere in Thailand (Chiengkul 2019; Lathapipat 2016; Lounkaew 2013; Pattaravanich et al. 2005). Moreover, the distribution of learning in Bangkok is as good as in high-income countries such as the United States. This means that students in Bangkok are receiving high-quality education like in other advanced countries. The World Bank (2012) called for improvements to the distribution of learning among rural areas for the country to have equal education quality.

This study aims to review recent developments in Thailand's basic education system, focusing on students' learning outcomes, and attempts to identify critical factors that explain such outcomes. While there is a growing body of research on basic education in other developing countries (e.g., Suryadarma et al. 2006; Ryan et al. 2009; Hanushek 2009; Asadullah, Perera, and Xiao 2020), to the best of my knowledge, this is the first paper that provides a comprehensive review of the Thai basic education system using a new dataset. The data used in this paper are obtained from several sources, for instance, the Ministry of Education, the National Institute of Educational Testing Service (NNIETS) and the National Statistical Office (NSO).

The next section provides a brief overview of the Thai education system. The third section briefly summarizes progress in expanding access to basic education over the past two decades. The subsequent section discusses students' learning outcomes. Issues and challenges in Thailand's basic education system are identified in the fifth section. The final section concludes.

2. Thailand's Education System

This section provides a brief account of the Thai education system, which consists of three main levels: early education, basic education and higher education.

Enrolment in the basic education system begins at the age of six. Basic education in Thailand is divided into six years of primary schooling (*Prathom* 1 to 6), three years of lower secondary schooling

(*Mattayom* 1 to 3), and three years of upper secondary schooling (*Mattayom* 4 to 6). Compulsory education in Thailand covers the first nine years of basic education. This means that attending preschool and upper secondary schooling is not mandatory. After completing lower secondary education, students can enrol in vocational and technical education as an alternative to a general academic path (upper secondary school programme).

Based on the 2007 Constitution and the 1999 National Education Act (with a 2010 amendment), all Thai citizens have equal rights to receive free basic education for at least twelve years. This free basic education provision covers pre-primary, primary and lower-secondary education. The Ministry of Education is responsible for overseeing all levels of education and formulating education policies. The Office of the Basic Education Commission (OBEC), founded in 2003, is responsible for formulating basic education policies, core curriculum and standards. It also monitors and evaluates teaching promotion in schools. Public basic education is also administered within schools as each school is responsible for its own administration, while management in several areas such as academic matters and general affairs is monitored by local administrative offices (LAO) (UNICEF 2017; Ministry of Education 2008).

In summary, Thailand implemented the first education reform in 1999, thanks to the 1999 National Education Act. This led to significant changes in the structure of management and administration, with an emphasis on the decentralization of administrative responsibilities to the local level. The Thai government also invests a significant amount of its resources into this section to support the initiative. Spending on basic education is about 15 to 20 per cent of national expenditure each year. The next section explains whether the reforms and increased spending have led to greater access to basic education in the country.

3. Progress in the Basic Education System

Over the past few decades, Thailand has made significant progress in increasing access to basic education. Table 1 shows enrolment rates (gross) in basic education from 1995 to 2020.

As shown in Table 1, primary school enrolment is always high due to the Primary Education Act, which was first promulgated in 1921. From 1995 to 2020, lower secondary school enrolment increased from 77 to 95 per cent. Over the same period, the upper secondary enrolment rate doubled. This rise in enrolment rates across the three basic education levels indicates success in expanding access to basic education to Thai citizens. Another improvement in basic education is reflected by the falling school dropout rates, as displayed in Table 2.

TABLE 1
Gross Enrolment Rate in Basic Education, 1995–2020

	1995	*2000*	*2005*	*2010*	*2015*	*2020*
Primary	110	106	104	104	102	101
Lower secondary	77	87	95	98	99	95
Upper secondary	41	58	64	72	78	81

NOTES: Gross enrolment rate is the number of students enrolled in a given level, regardless of age, expressed as a percentage of the official school-age population corresponding to the same level of education. A high enrolment rate generally indicates a high degree of participation in a given education level. However, the number can exceed 100 per cent due to the inclusion of over-aged and under-aged students as a result of early and/or late entrants and grade repetition.
SOURCE: Ministry of Education (2021).

TABLE 2
Number of School Dropouts in Basic Education, 2005–19

	2005	*2010*	*2015*	*2019*
Primary	29,703	6,786	1,313	121
	(0.69)	(0.19)	(0.04)	(0.00)
Lower secondary	48,777	20,155	2,837	681
	(2.11)	(0.94)	(0.16)	(0.04)
Upper secondary	20,775	10,886	1,417	1,045
	(2.21)	(1.03)	(0.13)	(0.11)

NOTE: School dropout rates (the number of school dropouts in a given level of education as a percentage of all students) are in parentheses.
SOURCE: Ministry of Education (2021).

Previously, the number of school dropouts was high, especially among students in upper secondary schools. Note that attending upper secondary education, *Mattayom* 4 to 6, is not compulsory. There has been some progress in reducing school dropouts in the past two decades. In 2002, more than 100,000 students dropped out of schools across all education levels. This figure was less than 2,000 in 2019. In the past, poverty was the most cited reason among students who left school. Now, family problems play a key role. Students drop out of school at the upper secondary level because they need to support their families. This means that economically disadvantaged students are more likely to drop out of school than their affluent classmates.

There have been other significant improvements in the basic education system. Over time, the student-teacher ratio has declined, falling from 20.23 in 2005 to 13.75 in 2019 (Ministry of Education 2019). Data from World Bank (2021) reveal that there are 16.64 students per teacher in the primary education segment and 25.95 students per teacher in secondary education. Such figures are relatively low compared to the world average and even other developing countries in Asia, such as the Philippines and Vietnam.

In addition, the literacy rate for the population aged six and above is very high; the total literacy rate was 93.9 in 2018. There was a moderate increase in the literacy rate between 2000 and 2018. Note, however, that more men than women are literate. The gender gap in the literacy rate is about 3 percentage points, and the gap has been relatively constant over time. Moreover, the average years of schooling have also increased over the past two decades in all age groups (see Table 3). Mean years of schooling stands at about eight for the population above twenty-five. Nevertheless, this figure is still lower than other developed countries and neighbouring countries like Singapore, Malaysia and Vietnam.

4. Students' Learning Outcomes

This section discusses students' learning outcomes. Thailand's national examination is known as "The Ordinary National Education Test" (O-NET). It includes a series of written examinations administered face-to-face and delivered through paper-pencil tests. The O-NET is mandatory for all students and serves as a selection tool for higher education programmes. It is administered annually by the National Institute of Educational Testing Services (NIETS) to Grade 6 (*Prathom* 6), Grade 9 (*Mattayom* 3), and Grade 12 (*Mattayom* 6) students in both public and private schools. The O-NET was first administered to Grade 12 students in 2005, then expanded to Grade 6 students in 2007, and since 2008 Grade 9 students have taken the test. Table 4 reports the O-NET results for Grade 6 students between 2011 and 2020.

TABLE 3
Average Years of Schooling, 2005–20

Age Group	*2005*	*2010*	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*
15–39	9.9	10.6	10.6	10.7	10.8	10.8	10.8	11.0
40–59	6.9	7.4	7.8	7.9	8.1	8.2	8.3	8.6
15–59	8.6	9	9.3	9.4	9.5	9.6	9.7	9.9
15+	7.8	8.2	8.5	8.6	8.6	8.6	8.7	8.9
60+	4.1	4.6	5.0	5.0	5.1	5.1	5.2	5.4

SOURCE: Ministry of Education (2021).

TABLE 4
O-NET Results for Grade 6 Students (*Prathom* 6), 2011–20

	2011	*2015*	*2020*	Δ*2011–20*	Δ*2015–20*
Overall	49.36	44.97	42.13	–7.23	–2.84
Thai language	50.04	49.33	56.20	6.16	6.87
English	38.37	40.31	43.55	5.18	3.24
Math	52.40	43.47	29.99	–22.41	–13.47
Science	40.82	42.59	38.78	–2.04	–3.81
Social studies	52.22	49.18	N/A	N/A	N/A

NOTE: Maximum score for each subject is 100.
SOURCE: NIETS (2021).

According to Table 4, the overall scores of Grade 6 students have fallen over the past decade. The average score for all subjects except the Thai language stood below fifty (out of 100). In addition, the average scores for English, Maths and Science have declined over the past five years. Table 5 reports the O-NET score for Grade 9 students.

Table 5 shows a worrying trend in the performance of Grade 9 students over the past ten years. The average scores for all subjects are lower than fifty and have fallen continually. In addition, average scores for Maths and Science have decreased consistently, especially over the past five years. Note that English is the only subject that saw an increase in the average score between 2017 and 2020. Table 6 shows performance in the O-NET for Grade 12 students (*Mattayom* 6).

As shown in Table 6, the average O-NET scores for Grade 12 students were below 50 in all tested subjects. And these scores have not changed significantly over the past decade. However, there was a slight improvement in the average scores for Maths and Science between 2011 and 2020, with a slight decrease between 2015 and 2020.

It is important to note that the O-NET has long been criticized for its failure to assess students' academic proficiency and for not testing students' use of knowledge and critical thinking. There have been attempts to replace the O-NET with a more relevant academic proficiency test, but progress has stalled. Therefore, this paper presents Thai students' performance in the OECD's Programme for International Student Assessment (PISA).

Thailand has participated in PISA since 2000. In 2018, about 70 per cent of the country's fifteen-year-olds were covered. Students in Thailand scored lower than the OECD average in all subjects (see

TABLE 5
O-NET Results for Grade 9 Students (*Mattayom* 3), 2011–20

	2011	*2015*	*2020*	Δ*2011–20*	Δ*2015–20*
Overall	40.91	37.91	36.03	–4.88	–1.88
Thai language	48.11	42.64	54.29	6.18	11.65
English	30.49	30.62	34.38	3.89	3.76
Math	32.08	32.40	25.46	–6.62	–6.93
Science	32.19	37.63	29.89	–2.30	–7.74
Social studies	42.73	46.24	N/A	N/A	N/A

NOTE: Maximum score for each subject is 100.
SOURCE: NEITS (2021).

TABLE 6
O-NET Results for Grade 12 Students (*Mattayom* 6), 2011–20

	2011	*2015*	*2020*	Δ*2011–20*	Δ*2015–20*
Overall	34.95	34.81	33.78	–1.17	–1.03
Thai language	41.88	49.36	44.36	2.48	–5.00
English	21.80	24.98	29.94	8.14	4.96
Math	22.73	26.59	26.04	3.31	–0.55
Science	27.90	33.40	32.68	4.78	–0.72
Social studies	33.39	39.70	35.93	2.54	–3.77

NOTE: Maximum score for each subject is 100.
SOURCE: NEITS (2021).

Figure 1). In addition, Thai students underperformed their peers in several Southeast Asia countries (see Table A1 in the Appendix).

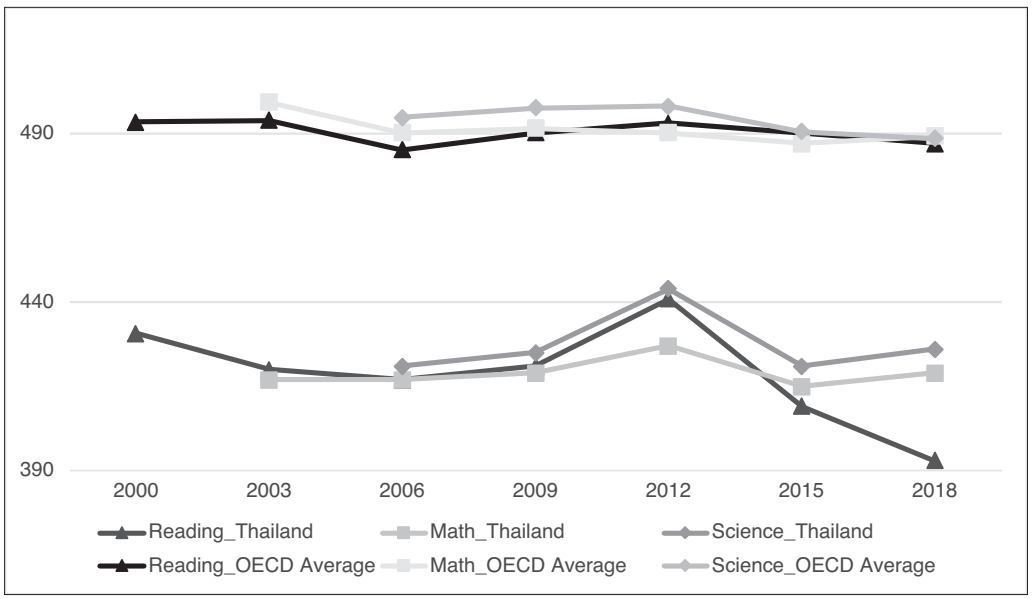
According to Figure 1, scores for all subjects (Reading, Maths and Science) have dropped significantly. In 2018, scores kept falling for Reading, while there was a slight increase in scores for Maths and Science. Between 2015 and 2018, the share of students who performed below the proficiency level for reading increased by 10 per cent while the shares for the other two subjects remained constant.

In addition, there is a wide gap in reading scores between economically disadvantaged and economically advantaged students and between urban and rural students. Those who study in private independent schools—schools that receive less than 50 per cent of their core funding from the government—perform better than those in public and private schools.

While low and declining average scores in both national and international examinations among Thai students are disappointing and worrying, it is important to note that such scores hide vast differences in academic performance between students in urban and rural areas. This inequality in education has long been raised by scholars (Sirilaksana 1993; Pattaravanich et al. 2005; World Bank 2012; Lounkaew 2013). Figure 2 compares learning achievement measured by national examination (O-NET) for three subjects between Bangkok and other regions.

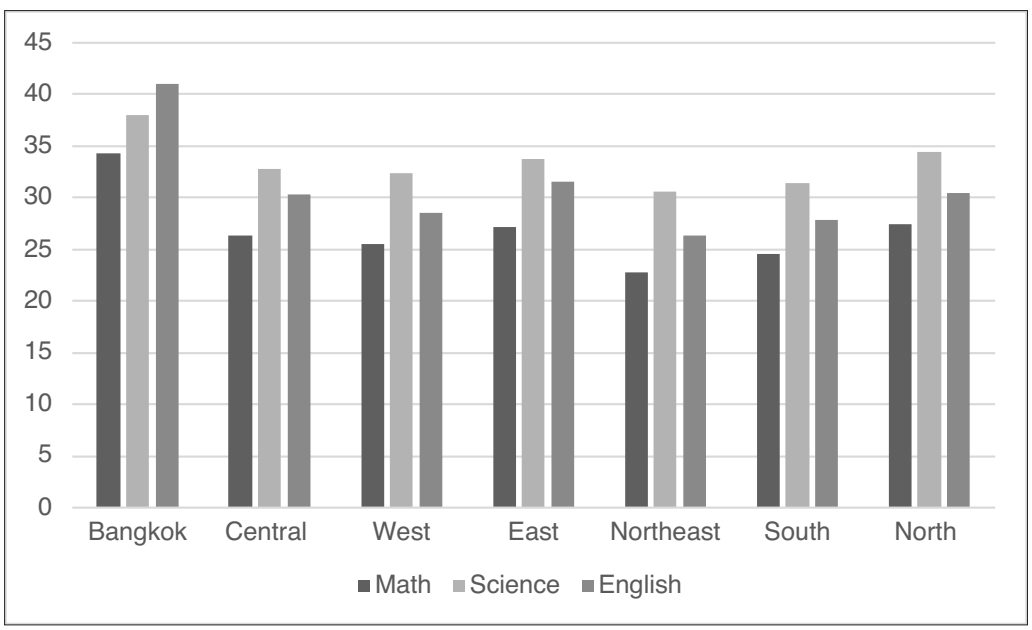
As demonstrated in Figure 2, large disparities exist in learning achievement between Bangkok and other areas in Thailand. Students in Bangkok outperformed students in other regions in Maths, Science

FIGURE 1
PISA Scores of Thai Students versus OECD Average, 2000–18



SOURCE: OECD, PISA 2018 database.

FIGURE 2
O-NET Scores by Region (Grade 12, *Mattayom* 6)



SOURCE: NIETS (2021).

and English. The average scores among students in other regions except the northeast are fairly similar. However, the average scores of the northeast students were the lowest in all subjects. These urban-rural learning outcomes differentials are not surprising due to differences in the quality of teachers and infrastructure across regions. Such vast disparities in learning achievement are also found among Grade 6 and 9 students (see Table A2 in the Appendix).

Large gaps in learning outcomes also exist across provinces. Thanks to available data at the provincial level, it is found that only twenty-four out of seventy-seven provinces achieved 2018 O-NET average scores higher than the country average. Consistent with an analysis at the regional level, most of them are in the central region of Thailand, while none are in the northeast region. A few northern (e.g., Chiang Mai and Phrae) and southern (Phuket and Trang) provinces are in this group. Table A3 in the Appendix reports average scores in the O-NET in the top-five-scoring provinces and the bottom-five-scoring provinces in 2014 and 2018. High-performing provinces are richer and more developed, measured by their income per capita. The low-performing provinces are remote and poorer. Moreover, average scores decreased between 2014 and 2018 in all provinces, but the poor-performing provinces (Yala, Pattani and Narathiwat) saw bigger declines in average scores. Out of the seventy-seven provinces, Bangkok registered the lowest drop in the average score of O-NET (by 0.43 percentage points). Nong Bua Lamphu, one of the northeast provinces, saw the biggest drop (by 4.48 percentage points). This is a worrying trend in academic performance among secondary students living in different areas and could worsen Thailand's education inequality.

5. Issues and Challenges

Over the past few decades, Thailand has made significant progress in increasing access to basic education. Primary and secondary enrolment has improved remarkably, with a notable increase in the adult literacy rate. However, students' learning outcomes from both national and international assessments are low and have not improved greatly. This suggests that the problem lies in the quality of education at primary and secondary levels, given the impressive number of total school enrolments. Warr (2019) argues that a backward and under-resourced educational system has caused Thailand to be caught in a middle-income trap.

Recent studies (e.g., Lounkaew 2013; Prasartpornsirichoke and Takahashi 2013; Wittayasin 2017; Lathapipat 2016) suggest that low learning outcomes and rising inequalities in students' academic performance in standardized assessments are central to the current debate in Thailand's basic education landscape. Lathapipat (2018) describes that students' educational quality in rural and urban areas is vastly different. This is primarily because students in rural areas often attend small schools (with fewer than 120 students), which lack high-quality teachers and infrastructure. Table 7 shows the number of small schools administered by the Office of the Basic Education Commission (OBEC) in 2020.

In 2020, approximately half of the 29,642 schools in Thailand were classified as small schools. About 970,000 students are currently enrolled in these small schools. In addition, more than two-thirds of primary schools have fewer than 120 students.

Closing or merging small schools is a controversial subject in Thailand. Several studies suggest that small schools are not cost-effective and have limited ability to deliver high-quality education (Strike 2008; Halsey 2011; Panpinya et al. 2021). Yet, it is argued that these schools provide learning opportunities, especially for poor students in rural areas, and that guardians and community representatives should play a role in dealing with this issue (Choomponla, Phongpinyo, and Larsak 2014; Wannagatesiri et al. 2014). According to the executive meeting at the Office of Permanent Secretary, Ministry of Education, out of 14,976 small schools across the country, 8,375 (56 per cent) need reform. About 200 small schools are planned to close soon.

TABLE 7
Small Schools in 2020

Level	*Schools with More Than 120 Students*	*Schools with Fewer Than 120 Students (Small Schools)*	*Total*
Primary school	6,251	13,962	20,213
	(31%)	(69%)	(100%)
Secondary school	2,186	171	2,357
	(93%)	(7%)	(100%)
Opportunity expansion school	6,136	837	6,973
	(88%)	(12%)	(100%)
Special education school	93	6	99
	(94%)	(6%)	(100%)
Total	14,666	14,976	29,642
	(49%)	(51%)	(100%)

SOURCE: Ministry of Education (2020).

Another issue related to the gap in education quality between urban and rural areas is linked to resource endowment. Sizeable public investment is required to reduce the disparity in endowment between schools by solving problems of teacher shortages and poor infrastructure. Given the sheer amount of public investment each year in primary and secondary schools, greater educational resources are necessary but insufficient to reduce inequality in education. Intangible aspects of education such as accountability, autonomy, management and perception of staff and students are also important in increasing education quality. Lounkaew (2013) utilized the Thai PISA 2009 literacy test to find that these intangible school characteristics can explain achievement gaps between students in urban and rural areas. Therefore, an increase in educational investment alone may not necessarily reduce student academic performance differentials.

Limited improvements in learning levels could have detrimental effects on the Thai economy, given the country's current stage of economic development. In the decades since the Second World War, Thailand has structurally transformed from a low-income, agriculture-based, closed economy to a middle-income, industrial-based and export-oriented economy. Sustained economic growth has resulted in large-scale poverty reduction. However, given the slowing economic growth since the 2000s, there is growing concern among policymakers and scholars that Thailand is caught in a middle-income trap. Several studies describe that both the quantity and quality of the workforce are central to the debate on Thailand's economic performance in the past few decades (Coxhead and Plangpraphan 1999; Warr 2005; Warr and Suphannachart 2020). And expanding the supply of human capital is viewed as an important tool to escape the trap (Jitsuchon 2012; Riedel 2019). Warr (2018) suggests that upgrading the quality of human resource through massive public investment and reform of the education curriculum is required to overcome the trap. Given poor learning outcomes among students and disparity in academic performance among students across the country, it is critical for Thailand to put more effort to raise the quality of its educational system.

Another issue is that the Thai population is ageing, driven by low fertility rates and long life expectancy. Thailand's births decreased from 796,091 in 2011 to 587,368 in 2020, the lowest birth rate in history. In addition, the total fertility rate stands at 1.51, lower than the replacement-level fertility (Department of Provincial Administration 2021). This has resulted in a declining student population. The

number of students enrolled in primary schools fell from about 6 million in 2002 to 5 million in 2010, and there were close to 4.7 million students in 2020. Over the same period, the number of students enrolled in pre-primary schools decreased from 2 to 1.64 million. However, the number of educational institutions and teachers in these schools has stayed relatively constant over the past two decades (Ministry of Education 2021). Thus, demographic change, resulting in decreased demand for basic education, seems to pose another challenge to the effective mobilization of resources in the educational system.

6. Discussion and Conclusion

As one of the upper-middle-income countries in the world, Thailand's remarkable economic development over the past few decades has been accompanied by startling improvements in indicators of well-being such as life expectancy, sanitation and adult literacy. Unsurprisingly, the sustained economic growth has been in line with the expansion of total school enrolments. However, given the slowing economic growth over the past two decades, many would argue that Thailand needs to undertake major reforms in education aimed at improving the quality of the workforce to overcome the middle-income trap. This paper constitutes the first step in understanding issues and key challenges in the basic education system in Thailand, with a focus on the recent decade.

A considerable amount of public and private investment in basic education has successfully increased school enrolment rates at both the primary and secondary levels. Nevertheless, this paper finds that students' learning outcomes are not satisfactory and have not improved significantly. Academic performance, especially for Grades 6 and 9 students in national examinations, remains low in Maths, Science and English. PISA scores of Thai students fall short of international standards and have not improved over the past ten years. More importantly, there is a significant disparity in learning outcomes between students in urban and rural areas. This achievement gap has not narrowed over time, which casts doubt on the current policy emphasis on providing equal access and quality of education to Thai citizens.

Differences in learning quality between urban and rural areas are due to insufficient educational resources and physical infrastructure in rural areas. Higher and better distribution of public education expenditure is necessary to narrow these differences. Recently, the Equitable Education Fund (EEF) was established under the Equitable Education Act 2018—with the objectives of providing financial support for children and youth who are in greatest need, and reducing inequality in education by forming partnerships with relevant stakeholders. In 2021, the EEF received a budget of THB6.08 billion, up from THD2.54 billion in 2018. The EEF provides financial support to extremely poor students to increase access to basic education and prevent school dropout. Students receive financial support on the condition that they maintain a school attendance record of more than 80 per cent; in addition, their weight and height are monitored to detect malnutrition. More than a million students nationwide receive this support (EEF 2021). It is recommended that the government add learning-related accountability measures to this programme to ensure improved student learning outcomes.

Many studies describe the lack of qualified teachers in rural areas as one of the key factors explaining inequality in basic education (Vandeweyer et al. 2021; World Bank Group 2015). Another issue, however, is the lack of school administrative staff, especially in small schools. Small schools receive relatively low budgets, but they are subject to the same key performance indicators as larger schools. Therefore, teachers in these small schools have to allocate time to perform administrative tasks themselves, which precludes them from focusing on teaching. Increasing the supply of administrative staff in small schools, especially in rural areas, could allow teachers to focus on improving students' learning outcomes.

Future research could shed light on factors that explain low student outcomes and inequality in education and the mechanisms through which these are influenced. In addition, it would be interesting to see whether differences exist in the quality of education between big, full-resourced and small, under-

resourced schools, and how local administrative offices could play a role in closing such gaps. Finally, it is also important to expand studies on the effects of educational inequality on other aspects, for instance, income, health and life satisfaction.

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APPENDIX

TABLE A1
2018 PISA Performance in Reading, Mathematics, and Science among Southeast Asian Countries

	Mathematics	*Reading*	*Science*
Brunei	430.11	408.07	430.98
Indonesia	378.67	370.97	396.07
Malaysia	440.21	414.98	437.62
Philippines	352.57	339.69	356.93
Singapore	569.01	549.46	550.94
Thailand	418.56	392.89	425.81
Vietnam	495.68	504.51	543.38
Average	440.68	425.80	448.82
Average (Developing SEA countries)	417.13	404.61	431.96

SOURCE: OECD, PISA 2018 database.

TABLE A2
2020 Regional O-NET Performance by Education Level

	Grade 12 (Mattayom 6)			*Grade 9 (Mattayom 3)*			*Grade 6 (Prathom 6)*		
	Maths	*Science*	*English*	*Maths*	*Science*	*English*	*Maths*	*Science*	*English*
Bangkok	34.35	37.94	40.97	31.61	33.02	43.87	34.76	42.48	57.22
Central	26.33	32.76	30.27	25.81	30.12	35.19	30.47	39.07	45.43
West	25.50	32.31	28.51	25.32	30.09	33.74	29.54	38.28	42.29
East	27.19	33.73	31.50	26.59	30.61	37.17	31.00	40.18	48.03
Northeast	22.83	30.64	26.31	23.82	28.99	31.92	28.33	37.35	38.71
South	24.61	31.42	27.86	25.04	29.46	33.61	29.41	38.25	41.43
North	27.44	34.37	30.45	26.99	31.00	35.75	31.29	40.07	45.60

SOURCE: NIETS (2021).

TABLE A3
2018 O-NET in Top- and Bottom-scoring Provinces

		2014	*2018*	*Change*
Whole country		37.56	35.02	–2.54
1	Bangkok (Central)	42.94	42.51	–0.43
2	Nakhon Prathom (Central)	41.01	39.60	–1.41
3	Phuket (South)	41.21	39.34	–1.87
4	Nakhon Nayok (Central)	40.02	38.66	–1.37
5	Nonthaburi (Central)	40.99	38.62	–2.37
72	Kalasin (Northeast)	34.19	30.34	–3.85
73	Nong Bua Lamphu (Northeast)	34.53	30.06	–4.48
74	Yala (South)	30.61	28.50	–2.11
75	Pattani (South)	29.50	28.04	–1.46
76	Narathiwat (South)	29.71	27.14	–2.57

SOURCE: NEITS (2021).

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Home Schooling during the COVID-19 Pandemic

An Assessment of Malaysia's PdPR Programme

M. Niaz Asadullah

Governments worldwide have introduced various programmes to facilitate distance learning in home settings during the COVID-19 school closure. However, given cross-country variations in state capacity, these schemes differ significantly in design, delivery and coverage. Within-country variation in poverty and home conditions also create added challenges for home-schooling programmes. Therefore, case studies examining country-specific initiatives are necessary. To this end, this paper examines the Pengajaran dan Pembelajaran di Rumah (PdPR) in Malaysia, an upper-middle-income country with high Internet coverage and a low level of extreme poverty. Data come from a purposefully designed nationwide social media survey on secondary school children conducted in January 2021. Under the PdPR scheme, the government created various technology-based platforms to ensure online learning. By way of studying children's participation in educational activities during school closure, this paper presents a descriptive assessment of PdPR. We first develop a conceptual framework to summarize the initiative. Then we examine the scheme in three aspects: the regularity of online lessons offered by school authorities; the extent of use of specific components and the medium of access of PdPR by learners; and their subjective evaluation of and difficulties faced with online schooling. Data confirm a significant socio-economic divide by income and location in access to EdTech as well as home support provisions. Most importantly, online lessons are irregular, and a significant proportion of students find online programmes challenging to follow. Given the dissatisfaction, most prefer to return to onsite education once schools reopen.

Keywords: COVID-19, EdTech, learning crisis, home-based education, school closure.

1. Introduction

Following COVID-19, there has been a global push for home-based teaching. In most instances, the distance learning strategies deployed in response to sudden school closures were "emergency remote

M. Niaz Asadullah is Professor of Economics at the School of Business, Monash University Malaysia, Jalan Lagoon Selatan, Bandar Sunway, 47500 Subang Jaya, Selangor, Malaysia; email: niaz.asadullah@monash.edu

education" (Dreesen et al. 2020; Toquero 2021). At the same time, there is concern over the digital divide and learning loss (Avanesian et al. 2021; Azevedo et al. 2021; Asadullah and Bhattacharjee 2022; Engzell et al. 2021; UNESCO, UNICEF, and World Bank 2020). Such losses are likely to be larger in countries and communities with poor social and physical infrastructure and/or prolonged school closures (Engzell et al. 2021). Malaysia, too, has suffered significant disruptions to schooling and is an important case study.

While many developing country governments have introduced popular media and Internet-based distance learning schemes, these are mostly on a piecemeal basis and lack coordination. On the other hand, soon after the school closure, the Malaysian government launched the *Pemakluman Pelaksanaan Pengajaran dan Pembelajaran di Rumah* (PdPR),[1] a comprehensive home-based learning programme. In addition to launching a blueprint for implementing the scheme, the government increased investment in education technology.[2] According to a recent global Survey on National Education Responses to COVID-19 School Closures, Malaysia ranks very high among upper-middle-income Asian countries in terms of access to digital technology at home (Internet and computer), including mobile phones and television (Asian Development Bank 2020). The country's pre-existing digital readiness could be crucial in averting a major learning crisis through PdPR.

Despite the early intervention and a wide range of activities and services introduced under the PdPR scheme, there is growing concern about its effectiveness. No comprehensive assessment exists documenting student participation in and experience of the initiative. In general, very little exists about the learning experience of Malaysian students during school closure. On the other hand, popular media have regularly reported various problems encountered by parents, students and teachers. Effective implementation of home-based learning requires a supportive family environment and complementary educational infrastructure. However, beyond the digital/technology access issue, not much attention has been given to the role of parents and families.

If the effectiveness of remote instruction is low, then according to one estimate, learning loss is likely to be the highest in Malaysia compared to other Asian developing countries (ADB 2021). The risk of such loss is significant given pre-pandemic learning poverty: 13 per cent of children in Malaysia are not proficient in reading (World Bank 2019). Malaysia also lags behind other High Performing Asian Economies (HPAEs) in the international assessment of student achievements (Perera and Asadullah 2019). These concerns motivate us to examine Malaysia's PdPR programme critically.

The general research objective of the study is to offer an assessment of the scheme in the context of learning continuity during school closure. The three specific research questions are as follows. First, what is the learning landscape at home in terms of household provisions and preparedness to support PdPR? What were some of the main constraints? Second, what has been the experience of online learning and participation in PdPR? Third, how did learners evaluate the programme? What is the attitude towards school reopening? To answer these questions, we use nationwide data from a purposefully designed cross-sectional social media survey. The study sample has a good representation of children from different income groups and COVID-affected families. The focus is entirely on secondary school students from the majority Bumiputera ethnic group, and the analytical approach is descriptive.

The rest of the paper is organized as follows. The next section explains the study context and conceptualizes PdPR. The third section describes the data and sample composition. The subsequent section presents the main findings, while the fifth section discusses the results highlighting their policy significance. The final section concludes.

2. Country Context: MCO, School Closure and PdPR

As in other countries, schools in Malaysia were closed from 18 March 2020, following the first movement order control (MCO). This affected 4.9 million students. The first MCO period lasted from 18 March 2020

to 15 July 2020, followed by MCO 2.0 (from 9 November 2020 to February 2021) and MCO 3.0 (from 3 May 2021 to September 2021). Overall, Malaysian school children attended in-person classes for only six months in 2020. Schools nationwide were allowed to reopen in stages, beginning from 15 July 2020, when the first stage started with Form One to Form Four and Standard Five to Standard Six students, then it continued with Standard One to Standard Four on 22 July 2020. Although the complete reopening of schools nationwide started in mid-July, students taking public examinations (SPM, STPM, STAM and SVM) and equivalent international school examinations were allowed to return to school and start their physical class on 24 June 2020 (Harun and Arumugam 2020). As Malaysia went through the third wave of infections, MOE once again announced the closure of schools nationwide starting from 9 November 2020 until 19 January 2021. Schools then reopened in phases (Nazari 2020).

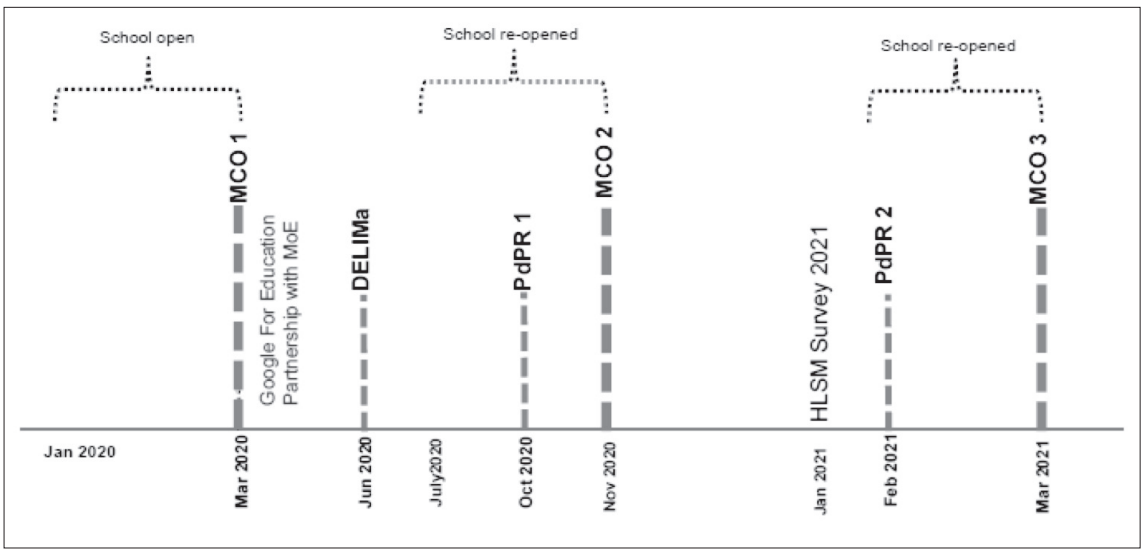
To ensure learning continuity during school closure, the government introduced home-based online learning on 18 March 2020, immediately after MCO 1.0 (Karim 2020). For this, the Ministry of Education partnered with Google For Education, along with other educational organizations, to conduct online webinars to upskill teachers for online learning to implement home-based learning, also popularly known as PdPR. More specifically, the MOE launched a Distance Learning (MoE-DL) platform that provides links to Google Classroom, Microsoft Teams, Digital Textbook, Edpuzzle (interactive teaching via video), Quizizz (game quiz) and Kahoot (game-based learning platform). ODL Videos link (i.e., EduwebTV and CikgooTube) could be accessed by all teachers, parents and students nationwide. In June 2020, the Ministry of Education formally branded its Google Classroom online learning platform as DELIMa (Digital Educational Learning Initiative Malaysia) after partnering with Microsoft, Google and Apple (Sharon 2020).[3] The MoE also collaborated with the Ministry of Communications and Multimedia to air daily lessons on RTM's TV Okey channel. This was partly to reach out to learners who could not access MoE's online education service, EduwebTV (Banoo 2020). In October 2020, the government launched a formal guideline for PdPR to assist teachers with implementing the scheme. This was further updated in February 2021.[4] Figure 1 summarizes the overall policy timeline. Since data used in this study research were collected in January 2021, the study essentially examines the first year of home-based learning.

How should we conceptualize the PdPR? To answer this question, a detailed description of the programme is necessary. Several factors are worth highlighting. First, the PdPR manual is a guideline for parents and teachers as well as a reference for MoE administrators from the district education office (PPD), state education departments (JPN) and divisions in the Ministry of Education Malaysia (KPM). Second, PdPR can be implemented online or offline or off-site.[5] Logistically, the programme works through a combination of three things: ODL (open and distance learning) online video links; various educational TV channels; and the DeLiMA platform for schools offering daily online lessons. The DeLiMA platform gives schoolteachers the digital tools to deliver daily online lessons. A teacher, however, may organize lessons using ODL online video links and home assignments delivered offline. Third, where the Internet is weak or unavailable, education TVs serve as an alternative. Students can use these to learn at their own pace, with or without daily online school lessons. They could also learn via television through Educational TV Programme that are aired from Monday to Friday via TV Okey, Radio Televisyen Malaysia Channel 110, MyFreeview TV (RTM), Channel 146 Astro, Astro NJOI, Tutor TV, Astro GO and DIDIKTV@ NTV7.

Fourth, it is expected that, regardless of the medium of instruction, responsible school teachers would remain in regular contact with students to implement home-based learning. In sum, teachers can implement PdPR via: learning platforms such as DELIMa, Cikgootube, EduWebTV and social media applications; applications such as Google Meet or Microsoft Teams live streaming; or eGames, video, audio clips, eBooks, recordings or online assignments.

Fifth, in addition to the manual (see Appendix A), MoE regularly communicated with all responsible education bodies through professional circulars and notification letters. As per the PdPR guideline, school

FIGURE 1
MCO, PdPR and Policy Timeline



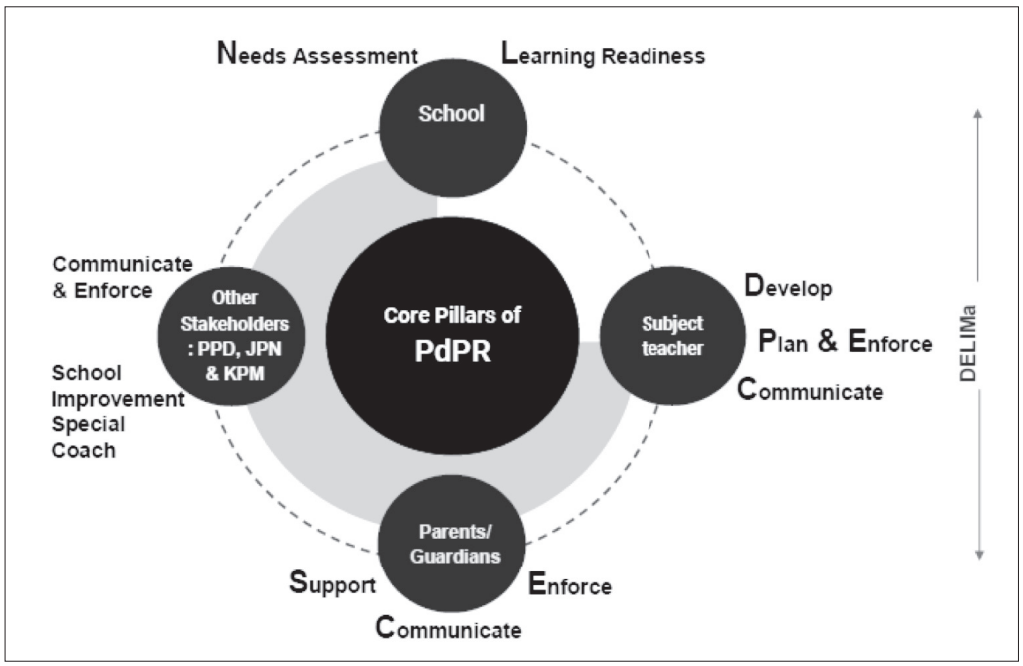
SOURCE: Author's creation.

authorities are expected to ensure that all students can follow the programme based on their needs and readiness. Equally, teachers are required to identify appropriate teaching methods (e.g., modules vs project-based learning) so that students can master the content of the prescribed subjects. Teachers are also encouraged to explore different and appropriate ways for learning continuity and increase student involvement (Figure 2).

If the PdPR scheme is implemented successfully, it can, in theory, avert major learning losses by ensuring learning continuity during school closure. In practice, despite the government guideline, there are important variations in how schools across the nation ensure home-based learning. For successful implementation, PdPR depends on effective coordination and communication involving multiple agents—principals, parents, subject teachers and MoE officials. And the nature of coordination varies depending on whether the scheme can be implemented online, offline, or off-site. At the same time, regardless of PdPR governance, home conditions are unequal, and there is also a significant divide in parental capability to support and enforce a home-learning regime. Add to these demand and supply-side educational challenges and the extra burden of economic and psychosocial distress caused by the pandemic.

Examples of specific parental capabilities include EdTech-related literacy among parents, such as familiarity with Google account registration or the ability to search for subjects in Google Classroom, browse subject materials on the DELIMA platform and YouTube, and handle Google Meet sessions for their children's online classes. Equally, the monitoring role of parents includes regularly verifying whether children attend online lessons and what they learn during PdPR lessons. In other words, PdPR requires proactive and digitally able parents and a congenial and supportive home environment. The success of the initiative also depends on at least four sets of factors: (i) effective leadership, preparation and implementation at the school level; (ii) regular online attendance of responsible/class teachers as well as their digital literacy; (iii) governance and monitoring of schools by local level education authorities; and (iv) physical provisions at home (e.g., access to the book, digital divide and the Internet) and capability of parents (e.g., digital literacy). Figure 3 summarizes this in a conceptual diagram.

FIGURE 2
Conceptualizing PdPR



SOURCE: Author's creation.

While there is no peer-reviewed publication on PdPR, here we cite three relevant reports. A joint study by UNICEF and UNFPA on 500 low-income urban families in Klang Valley found that 76 per cent want children to attend school physically instead of online learning (UNICEF and UNFPA 2020). The most mentioned reason (47 per cent) for not preferring online education had no place to study. Poor Internet connection was also cited as a key challenge for online learning. Among other findings, 28 per cent did not have any access to devices (computer/tablet/laptop); most (87 per cent) children used cell phones for online schooling during MCO.

Similar results have been obtained by a nationwide survey conducted in May 2020 by Teach for Malaysia covering 743 students. Most students surveyed (75 per cent) preferred onsite school attendance (Tan 2020). However, the survey also provided additional important insights. About 40 per cent of students have negative feelings about online learning experiences. Students attribute part of their online learning-related grievances to conflicting class schedules and unclear class organization systems. Compared to younger students (thirteen to sixteen years), older students (seventeen to eighteen years) reported being more tired, frustrated, anxious and lost in online learning.

Given the limited evidence, there has been intense debate on the effectiveness of PdPR in popular media. Apart from the question of the unsatisfactory "quality" of online education, complaints about absentee or lazy teachers have also emerged,[6] During a parliament session in July 2020, the then Education Minister Radzi Jidin brought to the fore the diverse socio-economic background of learners across the country and how that may have undermined the efficacy of online learning.[7] The Minister also quoted an unpublished survey by the Ministry of Education conducted in April 2020 on over 670,00 parents

and 893,00 learners, which found that (i) 36.9 per cent of students do not possess or have any access to devices, (ii) only 6 per cent of students have personal computers, 5.76 per cent tablets, 9 per cent laptops and 46 per cent smartphones.

In sum, all the available evidence reviewed in this section dates back to the early months of the school closure. While this does raise questions about the effectiveness of PdPR, we do not have any systematic evidence based on data after PdPR was fully implemented. Moreover, the PdPR manual is just a guideline for parents, teachers and responsible MoE officials. The actual student experience with online schooling under the scheme depends on what the teachers decide is the best method for their students, considering students' backgrounds and circumstances and how they are governed by school principals and MoE administrators. Teachers will differ in terms of methods to deliver the lessons depending on personal and location-specific circumstances. This is yet another reason to document the heterogeneity in students' online learning experience during school closure and, in that context, examine which is the biggest challenge: implementation-related issues or challenging circumstances at home.

3. Data and Sample

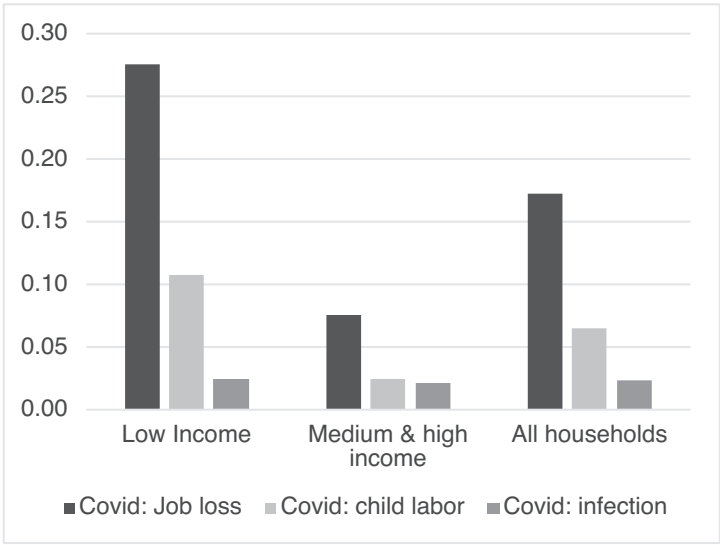
Our data come from a purposefully designed week-long social media-based cross-sectional survey completed in January 2021. In total, a little over 7,000 secondary school students 6,961 (7,111 including non-bumiputera) were reached via Instagram. The final working sample comprised 6,823 students, all of whom belong to the majority ethnic group (bumiputera Malay). Children of Chinese and Indian ethnicity were not included. Students from all secondary grades were allowed to participate. In the final sample, 42 per cent belonged to Form 5, 25 per cent Form 4, 20 per cent Form 3 and 13 per cent Forms 1–2).

Using social media as a data collection platform for a nationwide online survey for COVID-19 research is not uncommon in the literature.[8] Nonetheless, the non-representative nature of the data raises valid concerns relating to systematic bias in terms of the under-representation of certain demographic groups. To assess this, we looked at the sample composition in detail. While our data are not nationally representative (3 per cent of respondents are from East Malaysia—Sabah/Sarawak), the sample is nationally spread out. It has good coverage of students from various states of Peninsular Malaysia (Johor 9 per cent, Kedah 7 per cent Kelantan 10 per cent, Malacca 4 per cent, Negri Sembilan 4 per cent, Pahang 4.7 per cent, Penang 3.4 per cent, Perak 8.6 per cent, Terengganu 5.7 per cent, Kuala Lumpur 6.2 per cent and Selangor 31 per cent). Appendix Figure 1 plots state-wise response data against the population share of each state.

Other than the spatial distribution, the sample also over-represents female students. Otherwise, it has a broad representation of different income and social groups, particularly students from different income groups: almost half (48 per cent of the study children) belong to the bottom 40 per cent income groups (i.e., households with monthly household income below RM4,000). Among other notable characteristics, a significant portion of the sample belongs to COVID-affected households. Figure 3 reports data on sample Composition by COVID-19-related disruptions. Although 2 per cent of respondents reported having an infected member at home at the time of the survey, 17 per cent of sample children reported a fall in their family income while 6 per cent reported an increase in child lab or during the lockdown. Among children from poor households (monthly income less than RM2,000), 35 per cent reported an income loss while 12 per cent reported increased involvement of children in paid work.[9]

In sum, HLSMS 2021 over-represents educationally better-provided locations (i.e., Selangor and West Malaysia) and female students. Moreover, we cannot distinguish between rural and urban children. Among other limitations, teachers and parents were not interviewed directly. Children active on social media may share unobserved traits. Lastly, we did not collect data on student/teacher absenteeism. In other words, HLSMS data is subject to some limitations. But we argue that for these reasons, the data

FIGURE 3
COVID-19 Exposure and Related Shocks



NOTES: (1) "Job loss" is based on a response to the following question: "Last year (2020), did any of your parents lose their job or stop working last year for more than 1 month?".
(2) "Child labour" is based on the response to the following question: "Did you have to work to support your family last year?".
(3) "COVID infection" is defined based on the following question: "Did anyone from your family (parents/brother/sister/you) got infected by COVID-19 last year?".
(4) Income group differences in "job loss" and "child labour" are statistically significant at the 1 per cent level.
SOURCE: Author's survey.

should give us at least a conservative assessment of home learning compared to what we would learn from a more representative survey with better coverage of poorer locations and student populations without Internet access (social media).

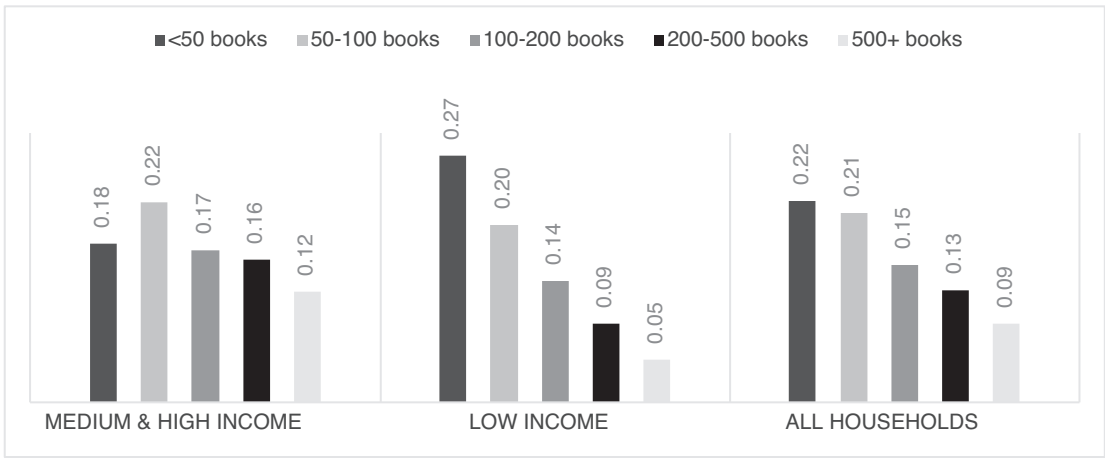
We have organized the findings into different subsections: To assess the disadvantages associated with monetary poverty, we have sliced the data by family income. The next section discusses these in detail.

4. Main Results

4.1 Socio-economic Divide in Home Environment

A widely used proxy for the learning environment at home in terms of physical inputs is the number of books (Schütz, Ursprung, and Wößmann 2008; Sieben and Lechner 2019). Figure 4 presents data on access to learning materials in terms of the availability of books. On average, 57 per cent of children reported having more than 100 books at home.[10] However, there is a significant difference across socio-economic groups. Low-income family students have significantly fewer books at home: 5 per cent of students from low-income families report having more than 500 books at home (12 per cent for middle/high-income families). Similar differences are also evident in the distribution of EdTech infrastructure at home.

FIGURE 4
Number of Books at Home



NOTES: (1) The total count of books excludes e-books.
(2) All differences by income group are statistically significant at the 1 per cent level.
SOURCE: Author's survey.

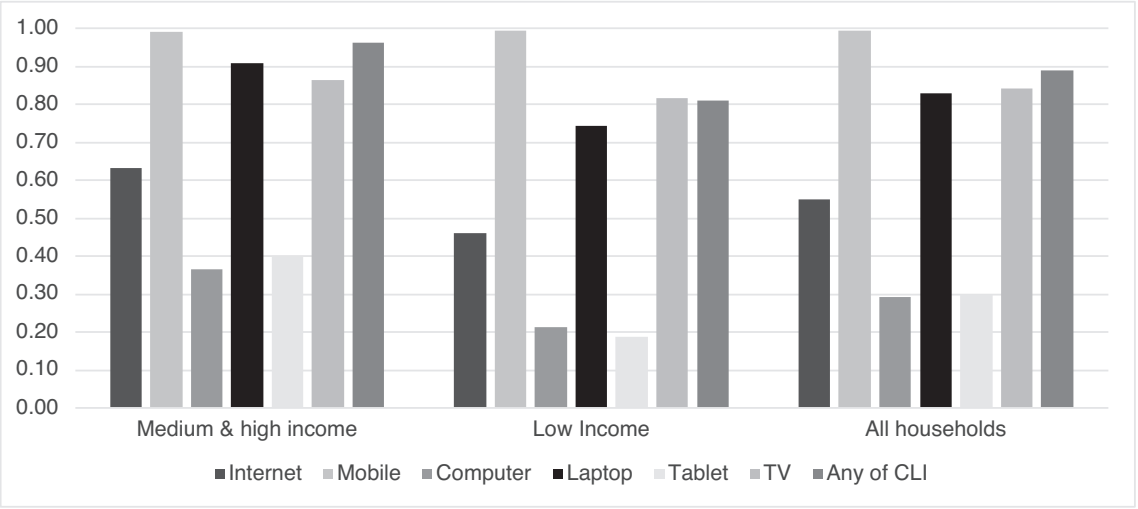
Figure 5 plots data on specific EdTech provisions: availability of mobile phones, computers, laptops, tablets and a TV. In addition, we report whether the learner has at least one of the followings: computer, tablet or laptop. Around 55 per cent reported having a good Internet connection at home.[11] Mobile ownership was near universal (99 per cent). Laptop (83 per cent) was more common than a (desktop) computer (29 per cent) and tablet (30 per cent). TV ownership was also high (84 per cent). When computers, laptops and tablets are considered together, 89 per cent of respondents reported at least one of these devices.

The digital divide in EdTech ownership is evident when we look at the distribution by income groups. Sample students from low-income families have lower access to the Internet and at least one computing device (computer/laptop/tablet). Only 46 per cent of low-income families report a good Internet connection at home against 63 per cent from the middle/high-income category. However, 81 per cent of low-income families report having at least one computing device at home against 96 per cent from the middle/high-income category. In other words, the rich-poor gap is less striking when we use a broader definition of access.

Yet, when it comes to the use of technology for educational purposes, regardless of income, the cell phone is the most popular choice (Figure 6). The use of any computing device is as low as 63 per cent in the low-income category. This implies that learners may be competing with others in the household for use of digital gadgets. Indeed 25 per cent of learners, regardless of income, identify this as a challenge. Another notable finding is that TV is well utilized as a learning modality compared to other developing countries (e.g., India).[12]

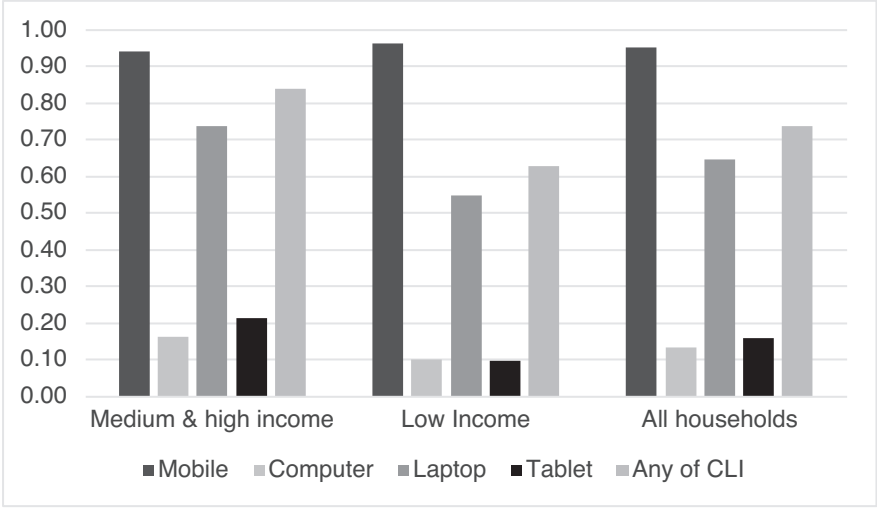
Beyond resources at home, students reported receiving limited family support (Figure 7). As high as 86 per cent reported having to "study alone", at least for some time. Among family members who assisted, the mother is named most frequently (29 per cent), followed by siblings (28 per cent), father (21 per cent), relatives (18 per cent) and "both parents" (15 per cent). Again, there is an income divide: 35 per cent of middle/high-income students reported a supporting mother against only 23 per cent of low-

FIGURE 5
EdTech and Digital Device Access at Home



NOTES: (1) The outcome variable is based on the response to the following question: "Which of the following facilities/devices that you have at home? (Tick all that apply)"; (2) Internet variable is based on response to the following question: "Do you have a good Internet connection at home?"; (3) All differences in technology access by income group are statistically significant at the 1 per cent level (except mobile phone availability).
SOURCE: Author's survey.

FIGURE 6
EdTech Use at Home



NOTES: (1) Outcome variable is based on the response to the following question: "Which devices did you use during online learning last year? (Tick all that apply)". Since there are multiple responses, the sum does not add up to 100. (2) All differences in Ed-tech use at home by income group are statistically significant at the 1 per cent level.
Source: Author's survey.

income learners. Similarly, 23 per cent of middle/high-income learners reported receiving support from both parents against only 13 per cent in the case of low-income learners. Students who received support from parents were significantly less likely to report studying alone (Appendix Table A).

Lastly, access to EdTech aside, learners faced a host of challenges at home during MCO (Figure 8); around 70 per cent reported unstable Internet as the main challenge, followed by family disturbance (62 per cent), increased household chores (56 per cent), having to share digital devices and no Internet connection (21 per cent). By income group, a significant difference is also noted in the case of lack of Internet access (28 per cent among low-income students compared to 16 per cent among middle/high-income students). However, the second commonly cited challenge is increased household chores (74 per cent among low-income students and 66 per cent among high-income students).

FIGURE 7
Family Support for Home-based Learning

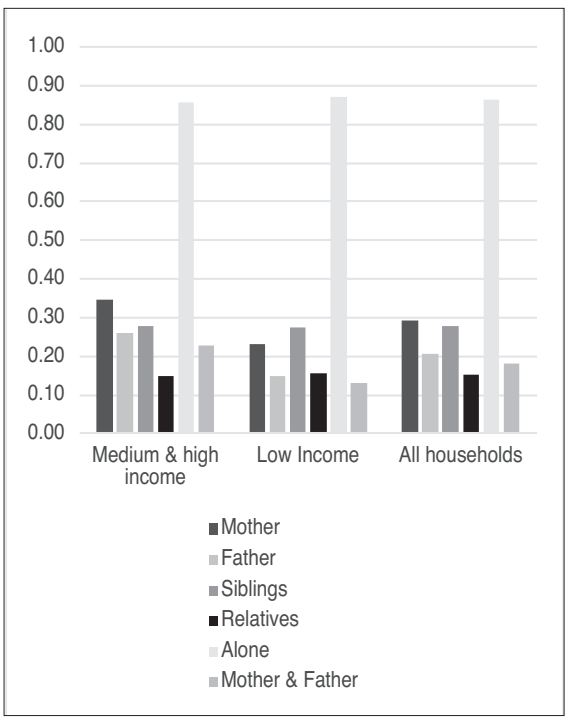
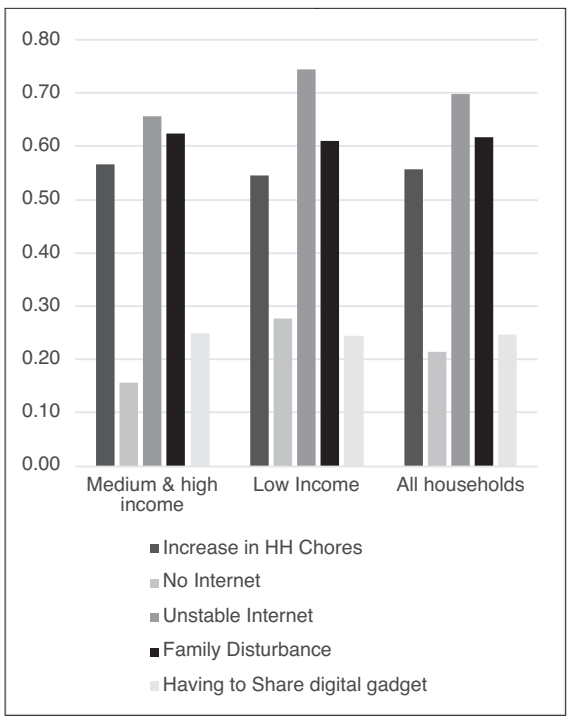


FIGURE 8
Challenge of Home-based Learning



NOTES: (1) Figure 7 is based on the response to the following question? "Apart from teacher/tutor, which family member regularly helped you with your study during the MCO?" (multiple answers allowed). The answer option "alone" indicates whether the student report having to study alone at least on some occasion (as opposed to always receiving assistance from a family member).
(2) Figure 8 is based on response to the following question: "What are the challenges you faced with online schooling (multiple answers allowed)?"
(3) All differences in different types of "Family support for home-based learning" by income group are statistically significant at the 1 per cent level (except support from relatives and siblings).
(4) All differences in different types of "challenges for home-based learning" by income group are statistically significant at the 10 per cent level (except "family disturbance" and "having to share digital gadget").
SOURCE: Author's survey.

In sum, similar to the EdTech divide at home, a significant divide prevails in terms of actual access to EdTech infrastructure. Beyond access, there is also a family divide in terms of the support for home learning across income groups. There are unequal learning opportunities and support at home among bumiputera students. These gaps correlate well with family income. And considering Malaysia's high per capita income, these differences are significant.

4.2 Participation in and Subjective Assessment of PdPR

We assessed participation in two ways—in terms of the use of various technologies used for PdPR and by asking directly about the regularity of online lessons.[13] Figure 9 reports the different types of technology used for online education. Most students reported using various technology platforms for online learning purposes to which all teachers have access through MoE's DELIMa (Digital Educational Learning Initiative Malaysia). More specifically, Google class is the most common platform (89 per cent), followed by Telegram (85 per cent), Google Meet and WhatsApp (82 per cent), Zoom (77 per cent) and Skype (3 per cent).[14] There is no systematic difference between income groups. Based on the extensive use of various technology-based learning tools that are part of DELIMa, all students participated in online schooling under PdPR.

However, in terms of the actual conduct of online sessions by school authorities/teachers, there are large variations. Only 52 per cent of students reported that online classes were organized regularly by the school; 25 per cent reported irregular lessons, while the remaining 23 per cent reported no online classes at all. Although students from economically better-off households have a slightly higher exposure to regular online classes (55 per cent versus 49 per cent), even among this group, 20 per cent reported receiving no lesson at all; the remaining 24 per cent reported irregular online sessions. The irregularity may be related to poor governance and non-compliance by teachers and schools (Figure 10).

Another possibility is that students may have watched PdPR programmes on TV or online regardless of the school's online lessons. However, half of the sample students did not watch any PdPR programme regularly. Figure 11 reports the data. Among those who watched PdPR online programmes, 34 per cent did not find the quality satisfactory—they reported the programmes were not easy to follow.

Based on the results presented so far in this section, two main findings can be highlighted: first, a large proportion of students expressed dissatisfaction with the quality of lessons available online under the PdPR scheme (Figure 12); and second, almost half of the students (47 per cent) reported not receiving regular online lessons and 22 per cent did not receive any lesson at all. We conjecture that the latter finding is likely to reflect a governance problem. But it could well reflect the design of the PdPR scheme in that teachers can implement home-schooling offline or off-site. To explore this further, Figure 13 plots data on "missing online schooling lessons" by selected SES indicators. A significantly higher proportion of students without any digital device reporting missing classes suggest that indeed teachers may be offering lessons offline to these students. However, we also find no significant correlation between missing online lessons and unstable Internet or lack of access to the Internet. Differences based on COVID-19 job loss status, the number of books at home and TV availability are not statistically significant. However, there is a strong correlation between the mother's education and location (whether in Klang Valley). This indicates that educated mothers are more likely to hold teachers accountable for missing lessons and/or monitor their children. At the same time, we found no correlation between "studying alone" and "missing online school lessons" (the Pearson correlation coefficient is zero and not reported). This implies that students unattended by family members were not those disproportionately reporting missing online lessons.

We additionally asked the student respondents about their overall experience with the shift from onsite to online schooling under PdPR following the school closure. Most learners were not happy with the switch (Figure 14). Only 18.2 per cent were happy with the switch to online education, 33.6 per cent

FIGURE 9
Type of Online Communication Tools Used

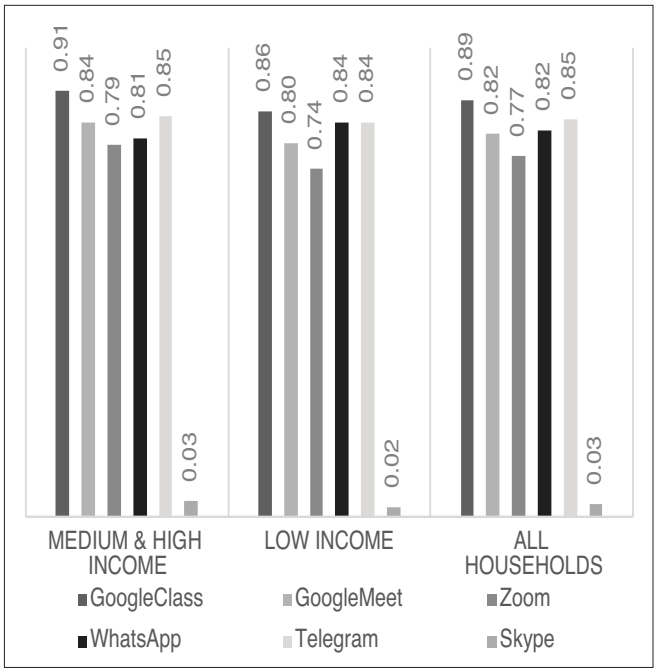
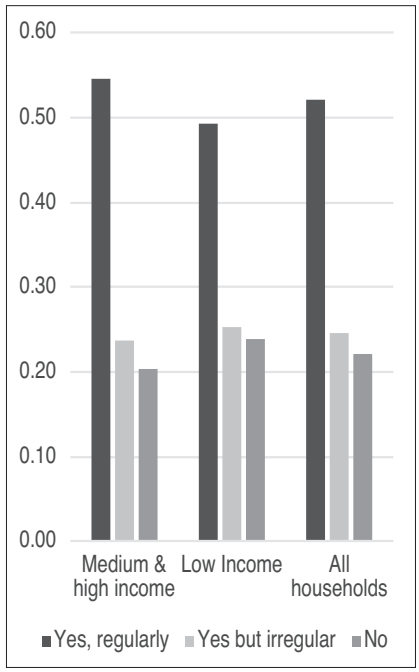


FIGURE 10
Regularity of Online Classes



NOTES: (1) Regularity of online classes is based on response to the following question: "Last year, did your school offer daily online classes?".
(2) All differences in different types of "online communication tools used" by income group are statistically significant at the 1 per cent level (except Telegram).
(3) All differences in different categories of "regularity of online classes" by income group are statistically significant at the 1 per cent level (except the category "Yes but irregular").
SOURCE: Author's survey.

were unhappy and 48.2 per cent were neutral. Low-income students were relatively unhappier (36 per cent) compared to medium and middle/high-income students (31 per cent).

To understand better the related socio-economic correlates, we re-examined the data disaggregating across various socio-economic groups. As seen in Figure 15, learners who report "not happy with online schooling" are broadly spread out across different socio-economic groups. The exception includes students from Kuala Lumpur and the country's most urbanized and economically advanced state, Selangor. Together, the two regions are popularly known as the Klang Valley. Given that this is the most prosperous and educationally advanced part of the country, dissatisfaction with online schooling under PdPR once again raises concerns about educational governance during school closure.

4.3 Learner Attitudes towards Education and School Reopening

Beyond PdPR, we examined the overall attitude towards education while schools remained closed, including attitudes towards online versus onsite education once schools reopen. The majority (92 per

FIGURE 11
Did Not Use PdPR Online/TV Programmes

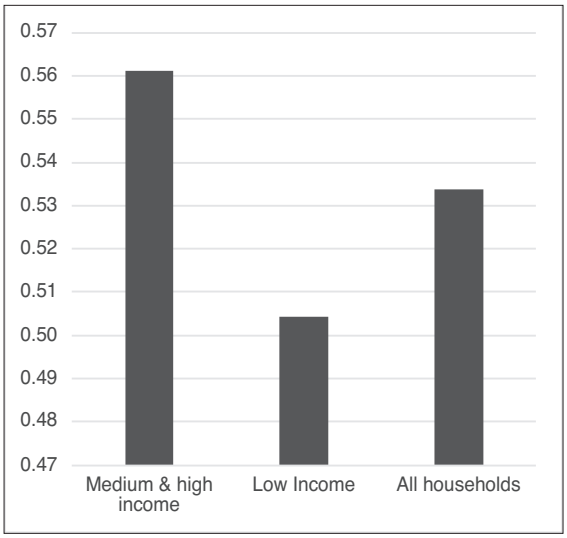
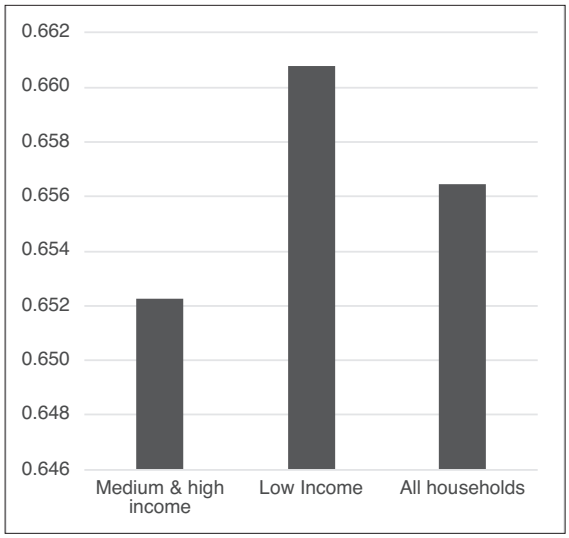


FIGURE 12
Quality of PdPR Programmes



NOTE: (1) Figure 11 is based on the response to the following question: "Did you watch any government (distance) learning programme?".
(2) Figure 12 is based on the response to the following question: "Did you find … the programmes easy to follow?".
(3) Differences in "use PdPR online/TV programmes" by income group is statistically significant at the 1 per cent level.

cent) of students reported that they have no intention of discontinuing schooling during the current school year (Figure 16). However, this also implies that 8 per cent of students are at risk of dropping out. That said, when asked about school reopening, the majority (80 per cent) responded saying that they preferred to have physical schooling, either fully onsite or blended with online lessons (Figure 17). But a sizeable proportion (20 per cent) are in favour of continuing with home-based schooling.[15]

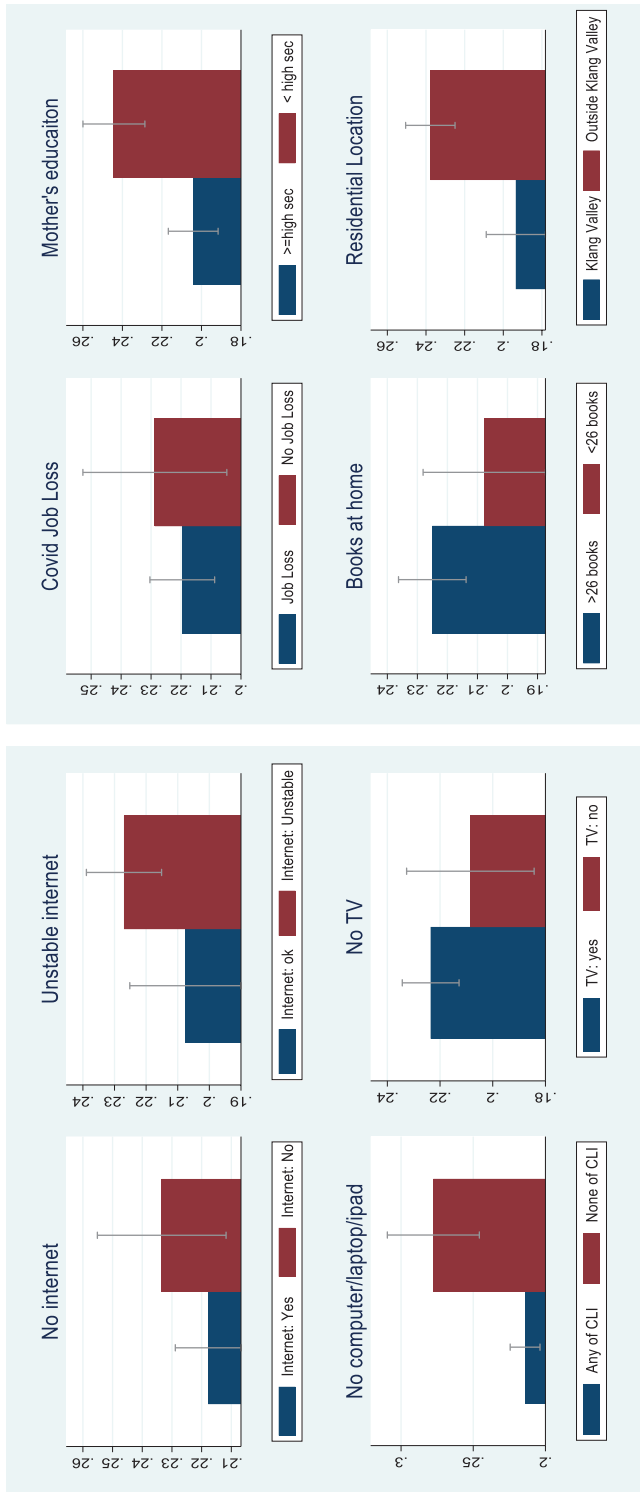
To better understand the desire to return to school, we again disaggregated the data by various SES indicators. The results are presented in Figure 18. Preference for returning to school is broad-based. While all students want to return to school regardless of home conditions, two aspects stand out: the desire is greater among students without any digital gadgets at home; and students from Malaysia's most urbanized and advanced part—Klang Valley—are most eager to return to school.

4.4 Heterogeneity by Student Gender and Region

Throughout, we have reported differences in PdPR-related indicators by household income level. This section summarizes similar differences by student gender (male versus female) and location (Klang Valley versus the rest of Malaysia). Since HLSMS 2021 does not distinguish between rural and urban locations, comparing Klang Valley with the rest of Malaysia helps in understanding regional disparity, given that the former is the most urbanized part of the country.

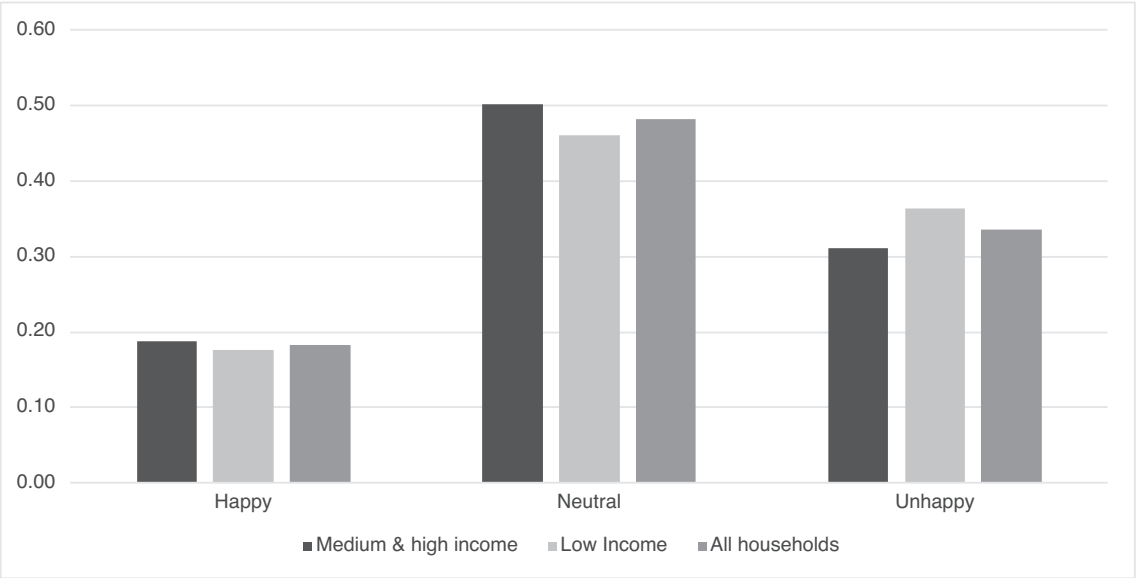
Table 1 reports the results alongside the *t*-test of difference. We do not see a significant gender gap in COVID-19-related shocks except that a higher proportion of boys report having worked to support

FIGURE 13
Missing Online School Lessons by Selected Socio-economic Correlates



NOTES: (1) The outcome variable—"missing online school lesson"—plotted is "proportion of students who received no online lessons from the school during the MCO".
(2) 95 per cent confidence interval reported.
SOURCE: Author's survey.

FIGURE 14
Student's Assessment of Switch to Online Education

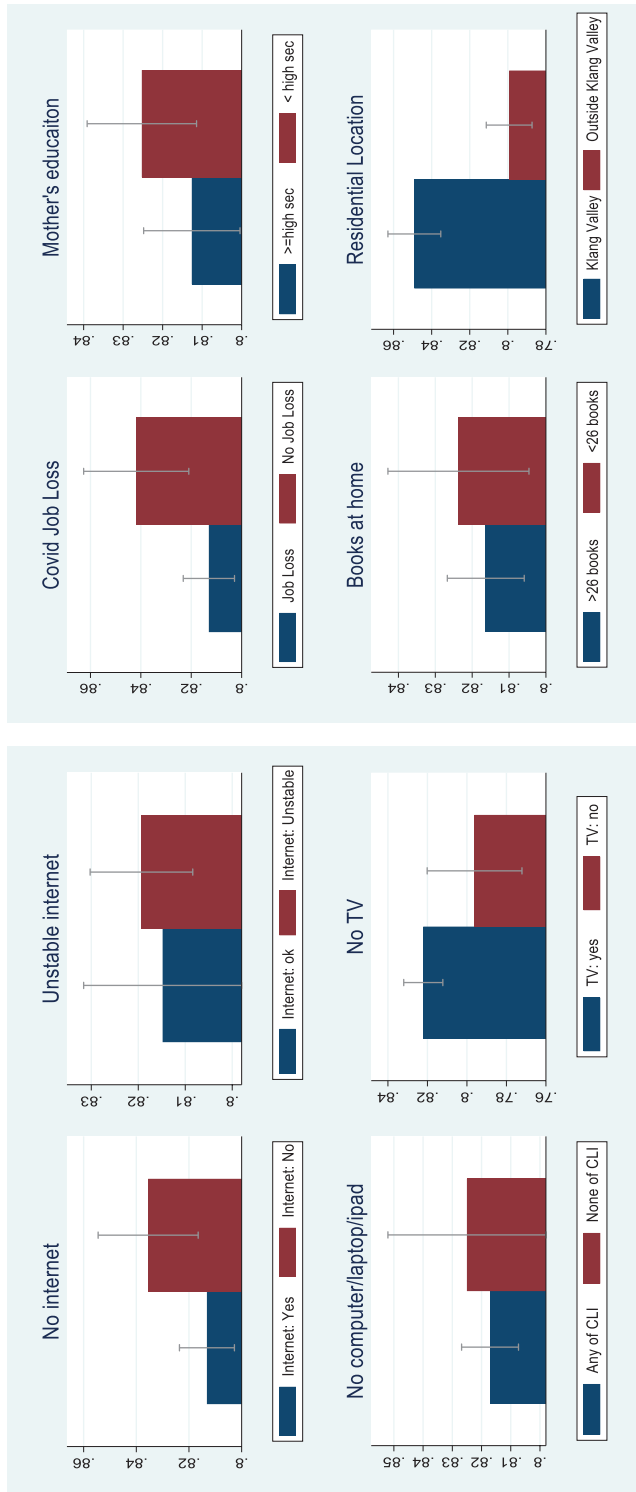


NOTES: The outcome variable is based on the response to the following question: "Teaching and learning have switched to online platforms since MCO 1.0 last year. How do you feel about this?"
SOURCE: Author's survey.

the family during the first year of the pandemic. In terms of access to learning materials, girls report having more books at home. There is also no systematic gender gap in: (i) access to digital devices at the household level; (ii) reported usage by the specific learner; and (iii) family support for home-based learning. However, some differences are significant when it comes to challenges faced with home-based learning. For instance, a higher proportion of girls report an increase in household chores vis-à-vis boys as a challenge. In addition, more girls reported family disturbance compared to boys. But there is no gender difference in challenges related to access to or use of digital devices. We also do not find a systematic gender gap in various types of online communication tools used for PdPR. Reassuringly, the reported incidence of regular online learning sessions by teachers is identical across boys and girls. Turning to the use and subjective assessment of PdPR programmes, we notice some gender differences. Boys are more likely to have not watched any PdPR programme. They are also likely to have found the programmes difficult to follow compared to girls. Lastly, there is no gender difference in preference for school attendance in person, though girls show a significantly less preference for mixed-mode schooling compared to boys.

Turning to location-wise differences, we do not see a significant gender gap in COVID-19-related shocks. While learners from Klang Valley report a significantly higher proportion of parents suffering job loss, the difference is not large. The distribution of books at home does not vary significantly by location. However, there is a systematic regional advantage in favour of Klang Valley in: (i) access to digital devices at home; and (ii) reported usage by the learner. While a significantly higher proportion of learners from Klang Valley report using computers, laptops and tablets, those from elsewhere rely more on mobile phones. Interestingly, the latter group of learners also report receiving significantly more support

FIGURE 15
"Unhappiness" with Online Schooling



NOTES: 95 per cent confidence interval reported. Unhappiness is defined as either "not happy" or "neutral".
SOURCE: Author's survey.

FIGURE 16
Intention to Continue Education

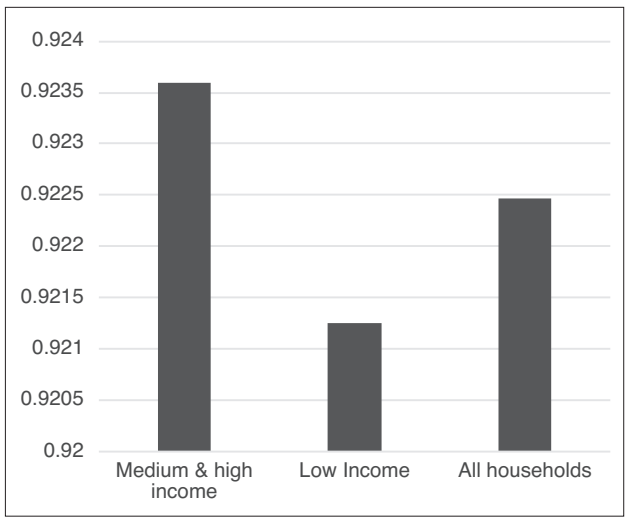
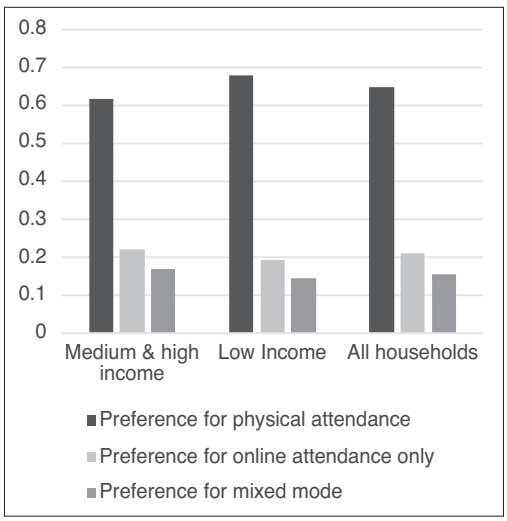


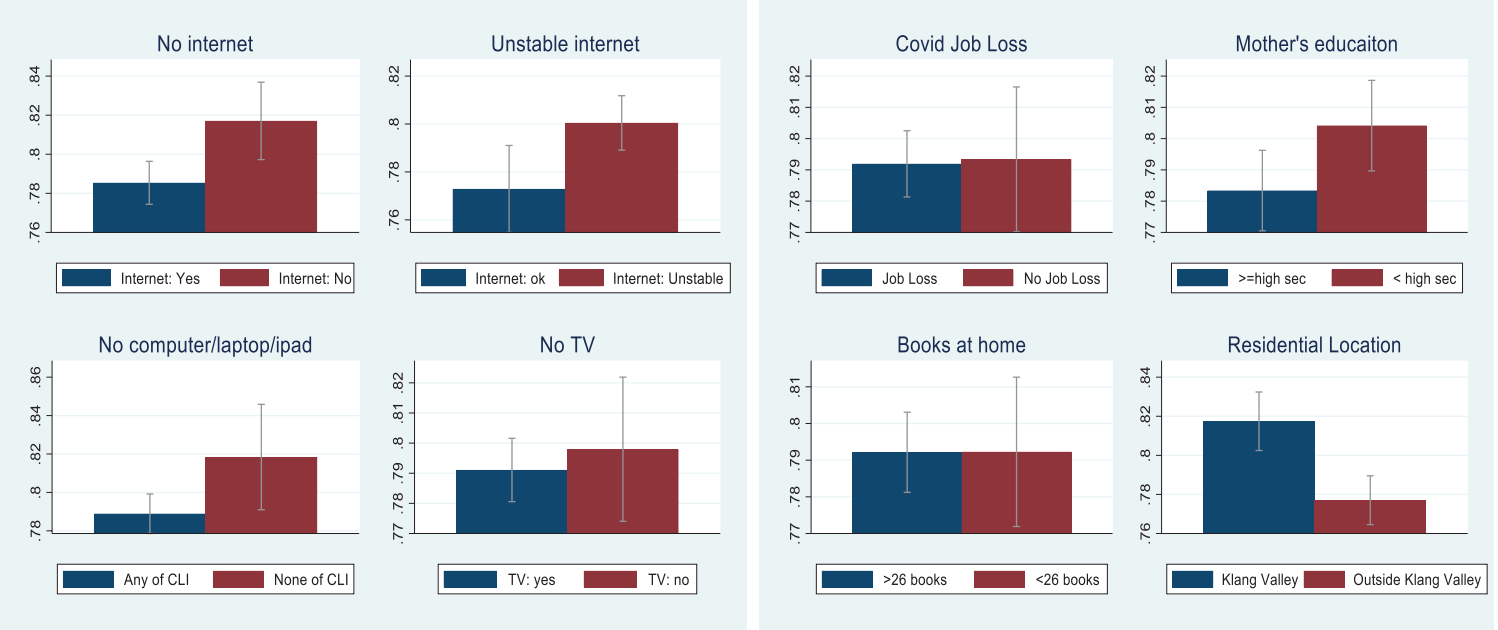
FIGURE 17
Preference for Returning to Onsite Schooling



NOTES: Figure 16 is based on the answer to the following question: "Do you plan to continue your school education this year (i.e., 2021)". Figure 17 is based on the answer to the following question: "If school reopens this year, will you attend classes physically or prefer online lessons?".
SOURCE: Author's survey.

from family members suggesting that urban parents are more time constrained to assist children with PdPR. Moreover, students from Klang Valley are also significantly more likely to report the incidence of increased child labour and family disturbance as challenges of online learning. On the other hand, those from outside the Valley report significantly more frequent EdTech-related challenges such as unstable Internet at home. We also note major regional differences in the type of online communication tools used for homeschooling purposes. WhatsApp and Telegram are significantly more common among learners outside Klang Valley, while Zoom and Google Meet dominate in Klang Valley. The reported incidence of online learning sessions by teachers is also significantly different by location: students from outside the Valley not only reportedly experienced fewer regular sessions, but a larger proportion also reported not having any online lessons. The latter could be driven by digitally excluded locations where PdPR could be implemented only in offline mode. Turning to the use and subjective assessment of PdPR programmes, we find some important differences. A significantly larger proportion of students from Klang Valley (56 per cent) did not use/watch any PdPR online/TV programmes compared to 48 per cent outside Klang Valley. Lastly, there is no location-specific difference in aspirations to continue education, though learners in Klang Valley show a significantly greater preference for mixed-mode schooling.

FIGURE 18
Preference for "Returning to Onsite Schooling"



NOTES: 95 per cent confidence interval reported. The outcome variable is "proportion of students who say that they prefer to have physical schooling, either fully onsite or blended with online lessons".
SOURCE: Author's survey.

TABLE 1
Gender and Regional Differences in Key Measures and Indicators

Indicators	*Male*	*Female*	*(t-test)*	*In Klang Valley*	*Outside Klang Valley*	*(t-test)*
COVID-19 exposure & related shocks						
Job loss by parents	0.18	0.17		0.18	0.17	**
Child labour by the learner	0.09	0.06	*	0.06	0.07	
COVID-19 Infection of family member	0.02	0.02		0.02	0.02	
Number of books at home						
<26	0.08	0.04	*	0.05	0.05	
26–50	0.23	0.22		0.22	0.22	
51–100	0.20	0.21		0.22	0.21	
101–200	0.12	0.16	*	0.15	0.16	
201–500	0.08	0.14	*	0.11	0.13	**
>500	0.07	0.09	*	0.08	0.09	
Access to Ed-tech/digital devices at home						
TV	0.81	0.85	*	0.84	0.84	
Mobile	0.99	0.99		0.99	0.99	
Computer	0.34	0.28	*	0.32	0.28	*
Laptop	0.80	0.83	*	0.86	0.81	*
Tablet	0.30	0.30		0.33	0.28	*
Any of CLI (computer, laptop or tablet)	0.88	0.89		0.92	0.87	*
Ed-tech use at home						
Mobile	0.94	0.96	*	0.93	0.96	*
Computer	0.18	0.12	*	0.14	0.13	***
Laptop	0.62	0.66	*	0.69	0.62	*
Tablet (& I-pad)	0.15	0.16		0.18	0.15	*
Any of CLI (computer, laptop or tablet)	0.73	0.74		0.79	0.71	*
Family support for home-based learning						
Mother	0.30	0.29		0.27	0.31	*
Father	0.22	0.20		0.19	0.22	*
Siblings	0.25	0.28	*	0.24	0.30	*
Relatives	0.15	0.15		0.14	0.16	
Study alone	0.82	0.87	*	0.87	0.86	
Both parents	0.19	0.17		0.16	0.19	*
Challenges of home-based learning						
Increase in HH chores	0.46	0.58	*	0.58	0.54	*
No Internet at home	0.20	0.22	**	0.17	0.24	*
Unstable Internet	0.69	0.70		0.66	0.72	*
Family disturbance	0.54	0.64	*	0.66	0.59	*
Having to share a digital gadget	0.23	0.25		0.26	0.24	*
Type of online communication tools used						
WhatsApp	0.78	0.83	*	0.80	0.83	*
Zoom	0.74	0.78	*	0.79	0.76	*

Google Class	0.93	0.95	***	0.96	0.93	*
Google Meet	0.87	0.89	**	0.92	0.87	*
Skype	0.04	0.03	**	0.03	0.02	**
Telegram	0.81	0.86	*	0.79	0.88	*
Regularity of online classes						
Yes regularly	0.51	0.52		0.56	0.50	*
Yes but irregular	0.26	0.24	***	0.24	0.25	
No	0.21	0.22		0.19	0.24	*
Use and quality of PdPR programmes						
Did not use PdPR online/TV programmes	0.57	0.49	*	0.56	0.48	*
Quality of PdPR programmes (easy to follow)	0.57	0.68	*	0.61	0.68	*
Student's assessment of switch to online education						
Happy	0.19	0.18		0.15	0.20	*
Neutral	0.46	0.49	***	0.51	0.47	*
Unhappy	0.35	0.33		0.34	0.33	
Aspirations and preferences for schooling						
Intention to continue in education	0.92	0.92		0.92	0.92	
Preference for return to onsite schooling						
Preference for physical attendance	0.66	0.64		0.65	0.64	
Preference for online attendance only	0.17	0.22	*	0.18	0.22	*
Preference for mixed mode	0.11	0.09	**	0.11	0.09	*

NOTES: (1) t-statistics corresponds to two-tailed tests. (2) *, ** and *** indicate significance at the 1 per cent, 5 per cent and 10 per cent levels, respectively.
SOURCE: HLSMS 2021.

5. Discussion and Policy Implications

Our results are consistent with the emerging academic evidence evaluating the government's distance learning programmes in at least three aspects. First, similar to developing country evidence that found that students from higher-educated and socio-economically better-off families are more likely to experience remote schooling (e.g., Hossain 2021), we also find evidence that a higher proportion of students from low-income households and those with less educated mothers report receiving no online lessons. Second, our finding that Malaysian learners favour regular classes, and a significant proportion are dissatisfied with online learning is consistent with existing developing country studies reporting negative feedback from students relating to remote learning during school closure (e.g., Selvaraj et al. 2021) and existing non-academic literature on Malaysia (e.g., UNICEF and UNFPA 2020). Third, our finding of the divide in EdTech access and usage is consistent with the available developing country evidence on the divide in the effective use of learning technology (e.g., Cappelle et al. 2021).

The findings presented in this study also have important policy implications, given the launch of several policy documents and plans. They also confirm some of the existing concerns of the Government of Malaysia over PdPR and the inadequacy of past measures. For instance, Malaysia's Penjana National Economic Recovery Plan supported various state-business joint initiatives to improve access to online education services delivered under the PdPR scheme.[16] This also encouraged some private Internet providers to launch additional support services. In addition, immediately after the first school closure, free Internet was offered to customers of all Malaysian telecommunication operators at RM600 million. Furthermore, an additional sum of RM400 million was invested in widening network coverage and

capacity, maintaining stable, high quality and availability of telecommunication services.[17] This ensured access to a range of education and productivity-related services considered critical for the successful implementation of the PdPR scheme. However, these measures have not been adequate.

The latest five-year plan for the period 2021–25 has emphasized improving access to quality and affordable education ("Supporting the M40 towards Equitable Society") as one of the key strategies to develop the youths. At the same time, the Twelfth Malaysia Plan (12MP)[18] has also acknowledged new challenges created by the pandemic as well as the digital and social divides:

> Due to the COVID-19 pandemic, students in schools, HEIs and TVET institutions have to undergo online teaching and learning. This caused problems for students with limited Internet access, especially those who live in rural and remote areas or from low-income families. Teachers and instructors in rural areas also face the challenge of ensuring that online teaching and learning sessions run smoothly. This has further hampered efforts in providing quality education in Sabah and Sarawak (12MP).

In this context, our findings are relevant as the first independent assessment of PdPR, particularly given the call for an evidence-based 12MP policy for post-pandemic educational recovery. The Annual Budget for the fiscal year 2022 has also retained the single focus on investment in physical inputs (e.g., laptops, school facilities and buildings) in low-income schools and communities (including the majority of bumiputera).[19] Our findings on the digital divide by income groups in the bumiputera community provide some justification for these measures. Likewise, recent budgetary provisions to improve EdTech access can be justified given our findings related to equity. There are unequal opportunities for using devices available at home for learning purposes. One measure in Budget 2022 is targeted at the bumiputera community whereby the higher learning institutions (IPT) students from B40 families will receive a free tablet through the *Peranti Siswa Keluarga Malaysia* initiative.[20] To this end, the government has allocated RM450 million. In addition, there is a special tax relief of up to RM2,500 for the purchase of mobile phones, computers and tablets until 21 December 2022.[21]

That said, our findings also highlighted two important gaps in recent policy documents in Malaysia. First is the lack of recognition of the inequality in familial support in terms of assistance for home study. Alongside teachers, day-to-day operations of home learning also depend on the effective monitoring of students by parents and family members. Yet, the sudden shift of lessons to home settings has globally left parents with little time to prepare for their new supporting role (UNESCO, UNICEF, and World Bank 2020). This is likely to be a serious challenge for low-income bumiputera parents. PdPR 1.0 lacked adequate parental guidance to assist children with home-based learning. While PdPR 2.0 has added some new instructions to aid parents in their new role, there are no clear provisions to build parental capability.

Second is the need to look into the potential governance deficit in the delivery of PdPR in terms of better online monitoring of teachers and learners by school authorities. Based on student reports, not only has online schooling been irregular, but it also did not prove popular among learners, including those who had received the lessons regularly. This evidence suggests gaps in governance and compliance by school authorities for online lesson provision. But the lack of parental capability could be an additional contributory factor. The school principals are responsible for the learning needs assessment of their students, coordinating daily lesson plans (e.g., whether to pool lessons across classes in a given grade for a subject) and monitoring teachers. In contrast, subject teachers are in charge of enforcing lesson plans and communicating with students and teachers. Parents, on the other hand, are supposed to report back to teachers any difficulty and coordinate offline lessons by visiting the school and collecting learning materials from teachers. In the first year of the pandemic (i.e., under PdPR 1.0), the Ministry of Education had no mechanism to track student attendance and teacher activities in real time. So differential, need-

based teaching could not be ensured. In the absence of a centralized mechanism for attendance monitoring under PdPR 1.0, regular monitoring of schools by local authorities remained another challenge.[22]

Lastly, our findings are relevant to the new social sciences literature on EdTech. This literature has focused on four areas: access to technology; effectiveness of CAL; technology-enabled behavioural interventions in education; and effectiveness of online learning (Escueta et al. 2020).[23] Available positive evidence of technology is mostly based on supplemental funding for technology or additional class time. The emerging body of evidence (including causal studies) confirms the little impact of providing hardware alone on learning outcomes. Considering this consensus in the literature, remedial policy response for COVID-19 educational recovery need to look beyond closing the digital divide.

6. Conclusion

COVID-19 has caused the most extended school shutdown all over the world, forcing education to shift from offline to online mode in home settings. In this context, this study focused on three aspects: first, home conditions and provisions in terms of learning materials, technology access and use, in order to assess the preparedness of Malaysian households to support PdPR, and whether the disadvantage is associated with poverty; second, what is the nature of participation in online schooling and the extent of use of PdPR programme; and third, how did the learners evaluate PdPR? What is the attitude towards school reopening?

There are three main takeaways from this study. First, there are unequal learning opportunities at home, not just in terms of availability of and access to resources, but also in terms of support from family members. This is not unexpected given the disruptions to family circumstances due to the pandemic, including job and income losses. Second, online schooling session has been irregular and not so popular among learners. Third, the preference for returning to school is strong among learners. This is unsurprising given the less than universal coverage of online schooling, lack of popularity among Malaysian (bumiputera) learners, the difficulty in following online programmes and unequal learning opportunities at home.[24] Overall, these patterns are consistent with popular perceptions of PdPR and evidence from other parts of developing Asia.

But how should we interpret the data on broad-based dissatisfaction over online schooling and the extent of regular online sessions organized by schools? We have shown that these do not correlate well with Internet provisions. Of all the correlates considered, one that stood out is location. Even among students from Klang Valley, 18 per cent report not receiving any schooling session and learners are also more eager to return to a physical school. This implies that, while demand-side constraints remain relevant and important, there was also a possible governance failure during PdPR 1 (e.g., lack of effective real-time monitoring of student attendance and teacher activities). At the same time, this could be partly explained by the flexibility and discretion teachers enjoyed under the PdPR guideline. According to the official directive, PdPR can be also implemented offline or off-site, particularly in locations with poor Internet access or under-provided communities with limited digital gadgets at home. We could not formally investigate these possibilities in the absence of school-level data, and we have left this for future research.

Acknowledgements

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APPENDIXES

APPENDIX A

Summary Note on the Official Guideline for PdPR

The Ministry of Education Malaysia has prepared a comprehensive Guide to facilitate Teaching and Learning at home version 2 (PDPR 2.0). To this end, a "Home Teaching and Learning Manual Version 2" was developed as an improvement on the "Home Teaching and Learning Manual" released on 2 October 2020. This Manual was developed to assist teachers to implement PdPR as a learning alternative to new norms. This manual is also expected to serve as a reference for school administrators, officers of the District Education Office (PPD) and the State Education Department (JPN), as well as Divisions in the Ministry of Education Malaysia (KPM). It should be read in conjunction with the professional circular letter, release letter, notification letter and relevant MOE guidelines currently in force. Schools are required to ensure that all students can follow the PdPR based on their needs and readiness. Equally, teachers need to identify appropriate PdPR methods so that students be able to master the content of the prescribed subjects. Teachers should also explore different and appropriate ways for continuity and increase student involvement in PdPR. Among the PdPR methods that can be used are learning using modules and project-based learning. Below we reproduce some key instructions for schools, teachers and parents in the PdPR guideline.

11.1. Learning modules need to be planned in a structured manner to meet the needs of the subject and implemented within the appropriate period.
11.2. The learning module developed should contain the following:
  11.2.1. Target students (preschool, primary, secondary).
  11.2.2. Module title or theme.
  11.2.3. Learning objectives based on the Curriculum and Assessment Standard Document (DSKP).
  11.2.4. Activity implementation period.
  11.2.5. Description related to the implementation of the activity.
  11.2.6. Structured notes related to the module title.
  11.2.7. Activities relevant to the topic of PdP (examples).
  11.2.8. Assessment to measure student mastery.
11.3. This learning module is distributed to students based on the Daily Teaching Plan (RPH) set.
11.4. Students need to submit the results of the assignment for review/assessment and get feedback from the teacher before receiving the next learning module.
11.5. Project-based Home Teaching and Learning (PdPR) is implemented according to subjects or a combination of several subjects. The implementation is as follows:
  11.5.1. Give a title to the student.
  11.5.2. Guide students to identify methods of completing a given project.
  11.5.3. Guide students to identify the materials, equipment and costs needed.
  11.5.4. Determine the time frame to complete the project.
  11.5.5. Guide students to complete projects.
  11.5.6. Present the results of the project.
  11.5.7. Make a reflection on the project revenue process.
11.6. Teachers can also implement other PdPR methods such as flipped classroom, inquiry-based learning, mastery learning, contextual learning and problem-solving learning.

Subject Teachers

6.3.1 Determine the content of the curriculum to be implemented based on the PdPR timetable.
6.3.2 Provide PdP materials and tutorials that are appropriate in the time allocation set in the PdPR timetable and can be re-accessed by students.
6.3.3 Implement PdPR based on the set time schedule.
6.3.4 Administer PBD in parallel with the implementation of PdP and tutorials implemented.
6.3.5 Networking with parents/guardians or students in implementing the PdPR timetable.
6.3.6 Inform parents/guardians and students in the event of any schedule changes.

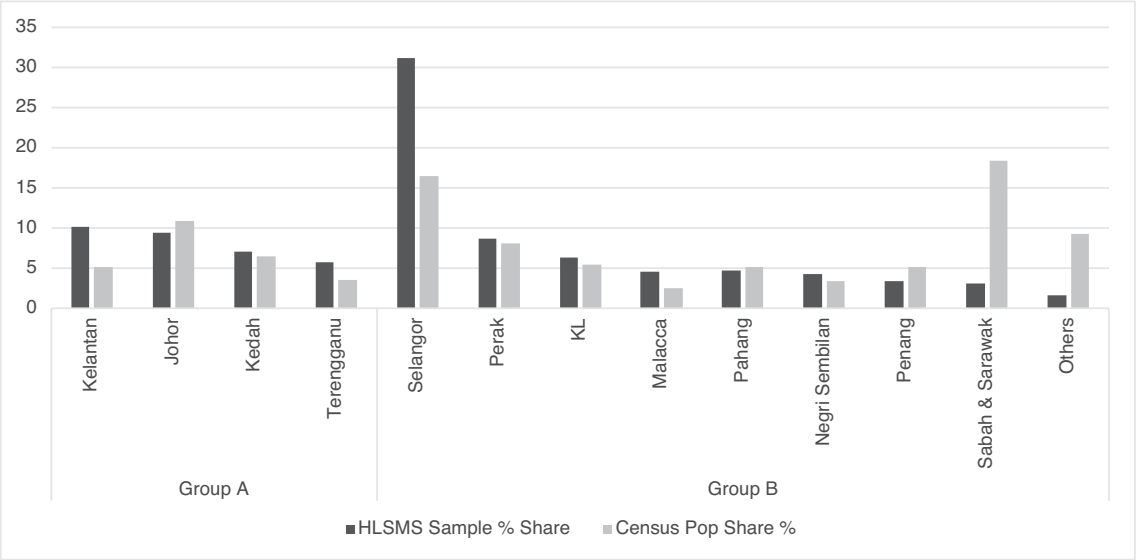
Parents/ Guardians

6.4.1 Ensure that the child/ ward receives the PdPR Timetable provided by the school.
6.4.2 Ensure that the child/ward follows the PdPR based on the set time schedule.

6.4.3 Communicate with the school to support the learning of the child/ward.
6.4.4 Provide support in helping the child/ward to learn.

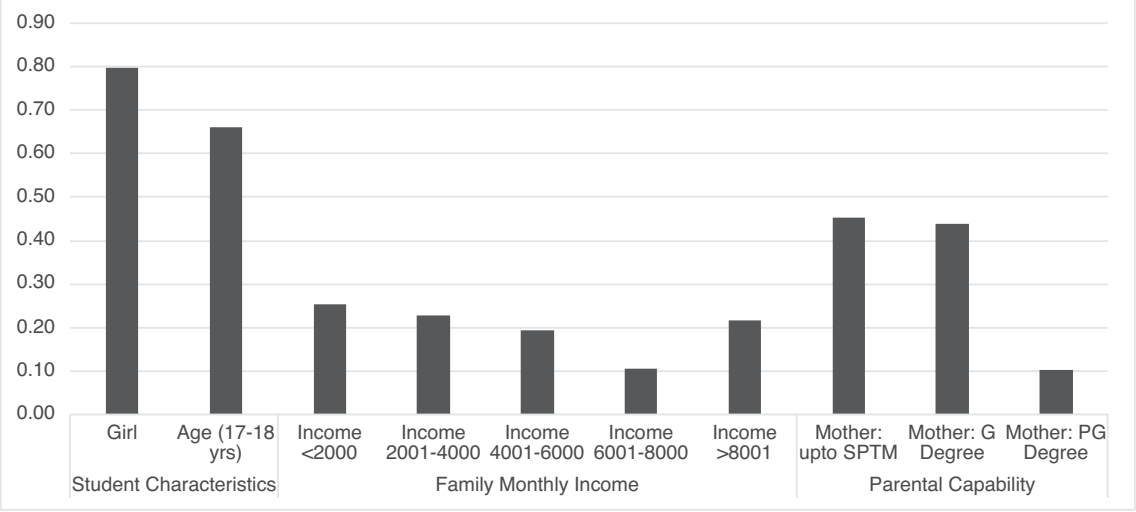
NOTE: Appendix A is a reproduction (translation) of the official guideline on PdPR 2.0 as available from https://www.pendidik2u.my/pengajaran-dan-pembelajaran-di-rumah-pdpr-2-0/ (accessed 30 October 2021).

APPENDIX FIGURE 1
Sample Composition: HLSMS 2021 versus Census 2010



NOTES: Population census data is from the Department of Statistics Malaysia. The grouping of states is based on the government's circular on school reopening dates. At the time of conducting this study, the proposed new session was to start between 13 June and 15 July for Group A schools (i.e. those in Johor, Kedah, Kelantan and Terengganu), and between 14 June and 16 July for Group B schools (i.e., those in Perlis, Penang, Perak, Selangor, Negeri Sembilan, Melaka, Pahang, Sabah, Sarawak, Kuala Lumpur, Labuan and Putrajaya).

APPENDIX FIGURE 2
Sample Composition by Demographic and Family Characteristics



APPENDIX TABLE A
Pearson's Correlation Coefficient Matrix: Family Support for Home Study

	Mother	*Father*	*Sibling*	*Relative*	*Alone*	*Both Parents*
Mother	1					
Father	0.64	1				
	(0.00)					
Sibling	0.24	0.23	1			
	(0.00)	(0.00)				
Relative	0.12	0.12	0.10	1		
	(0.00)	(0.00)	(0.00)			
Alone	–0.27	–0.22	–0.27	–0.07	1	
	(0.00)	(0.00)	(0.00)	(0.00)		
Both Parents	0.73	0.91	0.24	0.13	–0.22	1
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	

NOTE: p-values in parentheses.
SOURCE: Author's survey.

NOTES

1. https://www.moe.gov.my/muat-turun/lain-lain/manual-pdp-di-rumah/3727-manual-pdpdr/file
2. "Teks Ucapan: Pelan Jana Semula Ekonomi Negara (PENJANA)", 11 August 2020, https://www.pmo.gov.my/2020/06/teks-ucapan-pelan-jana-semula-ekonomi-negara-penjana/ (accessed 11 January 2021).
3. DELIMa was originally launched in July 2019 as new digital learning platform to enhance digital learning in schools. However, this was used further rebranded during the pandemic to ensure continuous access to learning during the pandemic. According to the 12MP document, 98 per cent of teachers used DELIMa by end of 2020.
4. https://www.pendidik2u.my/pengajaran-dan-pembelajaran-di-rumah-pdpr-2-0/
5. https://www.moe.gov.my/muat-turun/lain-lain/manual-pdp-di-rumah/3727-manual-pdpdr/file
6. https://www.malaymail.com/news/malaysia/2021/06/06/students-cant-return-to-school-next-week-to-still-undergo-pdpr-for-25-days/1979970
7. https://www.malaymail.com/news/malaysia/2020/07/16/education-ministry-over-one-in-three-students-couldnt-access-online-learnin/1885005
8. For other COVID-19-related research following similar survey approaches, see Ali et al. (2020).
9. The corresponding figures were only 5 per cent and 1.6 per cent in households with monthly income above RM8,000.
10. Compared to other Asian countries, an average fifteen-year-old Malaysian student has more books at home than a student in Vietnam but fewer compared to a student from South Korea and Singapore. In PISA 2012 data, 25.4 per cent Malaysian students reported having more than 100 books at home (Asadullah et al. 2020).
11. We only have a subjective measure of the goodness of Internet access; HLSMS 2021 has no technical details on the quality of Internet connection.
12. For evidence on India, see Cappelle et al. (2021).
13. "Irregularity" here refers to students missing classes because of school teachers not organizing online sessions. We did not collect data on student absenteeism.
14. The popularity of WhatsApp and Telegram is partly explained by the fact that they do not require high Internet speeds or large volumes of data. Therefore, they are the most viable options for students and teachers for remotely learning lessons with a slow Internet connection.
15. More specifically, 66.4 per cent said that they wish to attend school physically while 9.5 per cent preferred a combination of physical and online; 15 per cent said they do not want physical attendance while another 4.5 per cent said that they preferred to continue online (i.e. 19.5 per cent prefer a non-physical setting).

16. "Teks Ucapan: Pelan Jana Semula Ekonomi Negara (PENJANA)".
17. Prominent telecommunications operators also provided free Internet services to all Malaysian students. Students were given a free 1 gigabyte (GB) of Internet usage daily between 8 a.m. to 6 p.m. Besides, students had this access until 31 December 2020.
18. https://www.thestar.com.my/news/nation/2021/09/28/education-sector-calls-for-more-funding-and-autonomy
19. https://www.thestar.com.my/news/nation/2021/10/30/huge-boost-for-education
20. https://www.mcmc.gov.my/skmmgovmy/media/General/pdf2/FAQ_ENG_PERANTI_SISWA_KELUARGA_MALAYSIA_20211101.pdf
21. https://www.mof.gov.my/portal/en/news/press-citations/budget-2022-highlights
22. Only from June 2021, direct uploading of attendance records to MoE server has been regularized.
23. For a more recent review of EdTech in developing country context, see Rodriguez-Segura (2020); for a global review, see Dreesen et al. (2020).
24. However, even if online lessons are regular and easy to follow, some students might still prefer on-site education for other reasons such as a preference for in-school socialization.

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The Impact of Sending Top College Graduates to Rural Primary Schools

Masyhur A. Hilmy

Teacher quality is crucial to delivering good education. However, improving teacher quality in developing countries can be a tough task. This paper investigates the impact of a teacher placement programme that sends college graduates with a strong academic track record to teach in rural primary schools in Indonesia on student test scores. Using a difference-in-difference approach, the study finds that exposure to programme teachers for a semester is associated with a 0.16 standard deviation increase in their students' average mathematics scores. The weakest students benefited more, with an increase in score by 0.20 standard deviation. Students receiving direct instructions from programme teachers during scheduled classroom periods benefited even more. Attracting better talents to teach in rural schools could be an important pathway to improving the academic achievements of the weakest students at rural schools.

Keywords: Education, alternative teacher placement, Indonesia.

1. Introduction

Teacher quality is crucial to delivering good education (Chetty, Friedman, and Rockoff 2014; Glewwe et al. 2013). However, rural schools often struggle to meet this promise (Chaudhury et al. 2006). Selection into teaching is a key issue—education majors in colleges and universities do not attract the brightest talents, and few of them relish the career prospect in rural schools. Teacher absenteeism is rampant. Even when the teachers are present, the students are still often left with teachers who do not master their lessons or do not know how to teach, or both (Bold et al. 2019). To address these problems, governments and NGOs invest significant resources in a variety of interventions, but much remains unknown about their effectiveness (Evans and Popova 2016).

This paper studies a programme that places college graduates with strong academic and leadership backgrounds to teach at schools in rural areas in Indonesia. In particular, the article examines the Indonesia Mengajar programme, which has placed hundreds of teachers in rural schools since 2010.[1] Indonesia

Masyhur A. Hilmy is a PhD candidate in Economics at Boston University, 270 Bay State Rd, Boston, MA, 02215 USA; email: mhilmy@bu.edu

Mengajar recruits graduates of top Indonesian universities, trains them for six to eight weeks, and then sends them as teachers to primary schools across seventeen districts. Very few (<10 per cent) Indonesia Mengajar recruits have studied education majors in college. Most of them majored in engineering, natural and social sciences, or literature and the humanities. This contrasts with the regular teacher force in the programme districts, of whom 90 per cent have an education major. Programme recruits are assigned to specific schools just before deployment, and they take their placements as given.

The Indonesia Mengajar programme shares characteristics with Teach for America (TFA) and similar schemes in other countries, although Indonesia Mengajar is not an official member of its network (Teach for All 2021). Each Indonesia Mengajar teacher is contracted to teach for a year in rural Indonesia, but the school can host a succession of programme teachers for up to five years. Headmasters in the programme schools assign the teachers to either teach students as homeroom teachers (who teach multiple subjects for a particular grade) or as subject teachers (who teach specific subjects such as mathematics across grades). Indonesia Mengajar teachers live near their assigned schools, and the students in a treatment school regularly interact with them. The initiative may improve student outcomes because it exposes students to teachers with stronger academic backgrounds and who are more consistently present.

This paper investigates the impact of the programme using a difference-in-difference strategy between treatment and comparison schools. The treatment schools are schools where Indonesia Mengajar placed their first cohort of teachers in 2010. The comparison schools are schools where Indonesia Mengajar placed subsequent cohorts and other never-treated schools located in close proximity to the treatment school (<3 km). The programme's impact is identified under the assumption that outcome trends would be similar in both treated and comparison schools in the absence of treatment. The study estimates the impact of the Indonesia Mengajar programme on the students' mathematics scores using the Ministry of Education's 2008–11 examination score database. Because the 2011 examination took place before the second cohort of Indonesia Mengajar teachers were deployed, students in comparison schools had not been exposed to the programme during the examination. This allows a comparison to be made to estimate the programme's impact. At the same time, students in the treatment schools had been exposed to Indonesia Mengajar teachers for half a year, which allows the resulting estimates to be interpreted as the programme's short-term effect. The Ministry's dataset records each school's minimum, average, and maximum mathematics scores. This allows us to investigate how the programme teachers may affect students with various ability levels.

The results of this study show that exposure to Indonesia Mengajar teachers is associated with higher average mathematics scores by 0.14 points at the 10 per cent statistical significance level, which is equivalent to a 0.16 standard deviation. Indonesia Mengajar teachers seem to be particularly more effective in teaching the weakest students, and they raise the minimum score by 0.20 points. Meanwhile, the estimated effect on the maximum examination score is positive, but lower than the effect on the average score and not statistically significantly different from zero.

These estimates align with the most recent randomized evaluation of Teach for America (TFA) in the US. Students of TFA teachers in grades 1 and 2 perform significantly better in mathematics by 0.16 standard deviations (Clark and Isenberg 2020). However, the TFA evaluation measured the impact on students after a longer exposure than the Indonesia Mengajar teachers in this study (i.e., a two-year tenure for TFA fellows versus a half-year exposure to Indonesia Mengajar teachers at data collection). Suppose students benefit from more exposure to teachers with stronger academic ability. In this case, the estimated short-term impact of the programme may understate the total learning gains that the students received from the entire duration of the programme.

Classroom instructions from Indonesia Mengajar teachers drive these effects. To separate the effect of direct instruction from other changes (e.g., increased supervision) from the subdistrict superintendents that the programme's high-visibility status may have brought to treatment schools, the study uses Indonesia

Mengajar organizational reports that record the teaching assignments for all of the first cohort teachers. It is found that the mathematics score was higher for students with scheduled classroom instructions from Indonesia Mengajar teachers: their mathematics classes are associated with 0.40 points higher scores.

The weakest students appear to benefit more from Indonesia Mengajar teachers' Indonesian and science classes than the mathematics classes. The estimated effects are 0.74 and 1.04 points for Indonesian and science classes, respectively. These results suggest that the students benefited both from the use of mathematics concepts in science lessons and from more intensive use of the national language. Although school examinations are written in the Indonesian language, most of the population speaks local languages at home. Thus, comprehension problems may underlie the students' poor mathematics scores, and instructions that improve comprehension can boost performance.

The analysis in this paper contributes to several strands of literature. First, it presents new evidence of a Teach for America-style programme from a developing country, where expanded schooling access in recent decades has typically led to universal enrolment with low learning levels. To the best of the author's knowledge, this study is the first evaluation of such a programme outside the US and the UK. Since TFA's inception in 1990 and its first expansion to the UK as Teach First (TF) in 2003, this scheme has spread globally under the Teach for All (TFAll) network with affiliated programmes currently operating in sixty countries, including India, Peru, Nigeria, and many others (Teach for All 2021). This figure excludes programmes that are not officially part of the TFAll network but share similarities, such as the Teach First Norway and the Indonesia Mengajar programme, which adds to the global influence of the TFA idea. Despite the rapid expansion, there is little empirical research on the impact of the TFAll programmes outside of the two original countries (Thomas, Crawford-Garrett, and Rauschenberger 2021; see, e.g., Clark and Isenberg 2020 and the references therein for TFA and Allen and Allnutt 2017 for TF).

This paper also adds evidence to the literature on interventions that send educated individuals to areas with a low level of learning. Two recent studies are related to this paper. Chen et al. (2020) evaluated the impact of the send-down movement in the 1960s People's Republic of China and found that exposure to educated urban youths affected by the mandate to resettle in the countryside increased rural children's educational achievement. In the Gambia, Eble et al. (2021) show that a bundled para-teacher intervention programme modelled from a similar scheme in India (Lakshminarayana et al. 2013) led to a dramatic improvement in children's literacy and numeracy test results. This literature suggests that an effective intervention at a low baseline setting could lead to large gains in educational achievements.

More broadly, this paper also connects to the literature on the personnel economics of the state. This literature connects governance in developing countries with the public employees who perform government functions (Finan, Olken, and Pande 2017). Frontline service providers (e.g., teachers and nurses) play an instrumental part in the development process. The setting of this paper exemplifies the impact that talented individuals with prosocial leanings can have when they provide a public good in remote areas (Ashraf et al. 2020).

The remainder of this paper is organized as follows. The next section describes the context of the programme implementation. This third section outlines the empirical strategy. The results are described in the subsequent section. The fifth section concludes.

2. Context: The Indonesia Mengajar Programme

2.1 Background and Recruitment Process

The Indonesia Mengajar programme (literal translation: Indonesia Teaches) sends top university graduates to teach for a year in rural elementary schools across Indonesia. To become a teacher with the programme, individuals apply through the official website during the recruitment period. Applicants must provide

academic background information, complete essay prompts, and supply references. These initial screening shortlists applicants based on academic strength. Shortlisted applicants are then invited to the interview rounds to participate in individual interviews, group discussions, and classroom simulations. The later-stage screening further selects prosocial motivations and behaviours. Depending on the cohort, Indonesia Mengajar admits between thirty-three and seventy-five individuals to participate in its pre-deployment training camp. With thousands of applicants per cohort, this translates to a highly selective admission rate of under 1 per cent (Gozali 2020).

Indonesia Mengajar regularly attracts college graduates from top Indonesian universities. A college degree is required by Indonesian law to teach in primary schools. However, in practice, 32 per cent of primary school teachers in the seventeen districts where the programme operated did not meet this standard (Table 1). Whereas more than 90 per cent of primary school teachers in these districts majored

TABLE 1
Comparison of Indonesia Mengajar Teachers and Other Teachers by Education Level and College Majors

	IM Cohort 1		*IM 2010–15*		*Other Teachers*	
	N	*%*	*N*	*%*	*N*	*%*
Highest education level						
High school or lower					10,274	21%
Associate degree					5,470	11%
Bachelor's degree or higher	51	100%	614	100%	32,323	67%
College majors (for holders of associate degree or higher)						
Education (primary school)			6	1%	23,251	62%
Education (other than primary school)			64	10%	10,787	29%
Engineering and Computer Science	12	24%	81	13%	44	<1%
Literature and Humanities	10	20%	68	11%	266	1%
Economics, Business, Management	4	8%	63	10%	146	<1%
Communications	2	4%	57	9%	13	<1%
Public Admin, Poli Sci, Intl Relations	6	12%	53	9%	66	<1%
Basic Sciences	3	6%	49	8%	343	1%
Psychology	6	12%	48	8%		
Forest, Marine, Agriculture	3	6%	35	6%	21	<1%
Medicine, Pharmacy, Health			34	6%	3	<1%
Law			19	3%	45	<1%
Architecture, Planning and Development	2	4%	17	3%		
Art and Design	1	2%	11	2%	36	<1%
Other	2	4%	9	1%	694	2%
N/A					2,078	5%
Total	51	100%	614	100%	37,793	100%

NOTES: IM refers to Indonesia Mengajar. "IM 2010–2015" data includes the first ten cohorts of teachers. Statistics for "Other teachers" came from a subsample of primary school teachers who took the 2015 teacher competency test dataset and was teaching in one of the 17 programme districts.
SOURCE: Author's calculations.

in education, Indonesia Mengajar teachers typically did not graduate from an education major. None of the teachers that made up its first cohort had an education degree. Among the teachers it recruited until 2015, one in ten held an education major. The majority of these teachers instead have degrees in various engineering and science fields or literature and the humanities. Meanwhile, the origin universities of Indonesia Mengajar recruits are highly placed in the national ranking, with the top ten universities contributing more than half of its total teachers (Table 2).

Primary school teachers who graduated from the same universities as Indonesia Mengajar teachers scored higher on the nationwide competency test that the Ministry of Education held in 2015 than teachers in districts where the Indonesia Mengajar programme operated. The Ministry's threshold for the pass rate was 55/100, and the national average score was 53. Across Indonesia Mengajar operational districts, teachers score 48.6 on average, lower than the passing threshold and the national average. In contrast, teachers who were educated in top universities, where 75 per cent of the Indonesia Mengajar teachers

TABLE 2
Indonesia Mengajar Teachers by Origin Universities

	IM Teachers		*University Rank*	
University Name	*Cohort 1*	*2010–15*	*Indonesia*	*World*
UI/Universitas Indonesia	13	86	1	694
UGM/Universitas Gadjah Mada	7	78	6	1,496
ITB/Institut Teknologi Bandung	14	62	2	896
UNPAD/Universitas Padjajaran	3	39	27	2,986
IPB/Institut Pertanian Bogor	3	32	13	1,972
UNDIP/Universitas Diponegoro	3	29	9	1,753
UNAIR/Universitas Airlangga	5	23	7	1,551
UNIBRAW/Universitas Brawijaya		21	3	1,178
ITS Surabaya	1	15	4	1,220
UNS/Universitas Sebelas Maret		12	10	1,913
UPI Bandung		11	15	2,178
UM/Universitas Negeri Malang		10	23	2,839
UMM/Univ. Muhammadiyah Malang		10	34	3,298
UNHAS/Universitas Hasanuddin	1	9	17	2,550
USU/Universitas Sumatera Utara		8	8	1,575
Universitas Paramadina	1	8	168	7,816
UNP/Universitas Negeri Padang		7	25	2,919
UNESA/Universitas Negeri Surabaya		7	40	3,494
UNY/Universitas Negeri Yogyakarta		7	22	2,772
Overseas		19		1,606
Other		121	75	4,659
Total IM teachers/average rank	51	614	25	2,290

NOTES: IM refers to Indonesia Mengajar. IM teachers 2010–15 tabulated cohorts 1–10. University rank data from Webometrics, July 2020 ranking. Ranking for "overseas" and "other'' categories are the mean of specific universities, rounded down to the nearest integer. See Table A1 for the full list of overseas and other universities.
SOURCE: Author's calculations.

TABLE 3
Average Score from 2015 Teacher Competency Test, by Origin University and Age

	Mean	*Std Dev*	*N*	*Mean*	*Std Dev*	*N*
	All Nationwide			*<30 Year Olds*		
UI	72.5	12.7	246	74.6	12	20
UGM	77.9	10.2	349	80.4	7.4	13
ITB	80.8	8.7	39	81.8	.	1
UNPAD	72.2	11.7	452	68.3	12.1	37
IPB	77.5	9.8	380	76.1	9.4	26
UNDIP	77.7	9.5	312	77.7	10.3	32
UNAIR	75.9	10.9	144	68.2	12.9	5
UNIBRAW	75.4	10.7	249	73.5	11.1	17
ITS	80.1	10.4	109	70.8	11.4	11
UNS	67.5	13.1	5,645	75	10.7	1,308
UPI	60.3	12.7	19,413	65.7	11.9	4,646
UM	68.9	12.7	3,368	74.2	11.1	983
UMM	64.1	12.1	1,273	67.1	11.9	166
UNHAS	61.9	12.4	180	59.6	15.1	12
USU	64.9	12.2	283	66.9	11.5	37
PARAMADINA	81.8		1			
UNP	58.3	12	8,282	63	12.4	2,057
UNESA	65.2	13.3	3,919	69.7	11.9	823
UNY	70.2	12.6	5,113	73.7	12.3	1,521
Overall	74.4	12.3	49,757	72.8	12	11,715
	All Programme Districts			*<30 Year Olds*		
All education levels	48.6	11.3	48,067	50.3	11.4	7,417
Any college	49.5	11.3	37,793	51.2	11.6	4,511
Bachelor's and up	50.4	11.3	32,323	51.6	11.6	4,085
Open University	51.1	11.3	13,916	54.8	11.1	911
Other universities	49.5	11.2	17,159	50.4	11.5	3,014

NOTES: Statistics from a subsample of all 1.3 million primary school teachers who took the 2015 teacher competency test and graduated from the 19 universities who contributed the most Indonesia Mengajar teachers. Teachers in this summary statistics are located in all 34 provinces. Of the 19 universities here, only UNS, UPI, UM, UNP, UNESA, and UNY are historical teacher colleges. The mean and standard deviation in the bottom row (overall) is an average of the origin university-level observation, weighted by the number of Indonesia Mengajar teachers it contributed to between 2010–15. The national test average was 53/100 and the passing grade was 55/100.
SOURCE: Author's calculations.

graduated from, performed better on the test with a weighted average score of 74.4 (Table 3), even though most did not graduate with an education major.[2]

The Indonesia Mengajar programme shares characteristics with Teach for All affiliate programmes in various countries. It attracts applicants with strong academic leadership backgrounds, runs a highly selective screening process, trains recruits without formal education degrees, and contracts them to teach in low-income schools for a short period. The programme was launched in 2010, a period of rapid expansion

for the Teach for All network (Thomas, Crawford-Garrett, and Rauschenberger 2021). Nevertheless, Indonesia Mengajar is not an official member of the Teach for All network (Teach for All 2021). Instead, recruitment materials and other organizational publications refer to a send-down programme that deployed college students from Java to teach high schools in the outer islands between 1951 and 1962 as its origin.[3]

2.2 School Selection

Between 2010 and 2015, Indonesia Mengajar sent teachers to seventeen districts across Indonesia (Figure 1). These districts agreed to receive Indonesia Mengajar teachers[4] as is typical of less-developed districts that routinely suffer a high rate of teacher absenteeism. These include border districts, areas nearby Java with poor performance, and other remote districts.[5]

To select the target schools within the district, Indonesia Mengajar looked for schools with demonstrable needs. These schools often lack (permanent) teachers due to their location in remote areas (e.g., in a small island or mountain range beyond the electricity grid and cell coverage). Within a district, the programme also considers the geographical spread. A local contact listed prospective schools that programme officers visited from Jakarta before finalizing the school selection. Every year Indonesia Mengajar sends teachers to four to ten schools per district, and each target elementary school receives one Indonesia Mengajar teacher.

Teachers are sent to a school for up to five years. However, because each teacher is only contracted to teach for a year, the school will receive a new Indonesia Mengajar teacher every year for the duration of the programme. The target schools take teachers' placements from Indonesia Mengajar as given, but the headmasters have discretion in assigning duties to the Indonesia Mengajar teachers.

2.3 Teacher Preparation, Assignment, and Deployment

Indonesia Mengajar sends two cohorts per year: one in November–December and another in July. The organization views them as equivalent. The staggered timing happened because the recruitment drive for the first cohort was so unexpectedly successful, with more than 1,300 completed applications for just fifty-one places that the organization saw it fit to expand its operation into two recruitment-deployment cycles per year (Gozali 2020).

Indonesia Mengajar prepares the teachers they recruited with a six- to eight-week intensive preparation camp. During this pre-deployment camp, the teachers receive pedagogy training from education experts, study the national curriculum standards for grades one to six, take part in classroom practicums, and participate in leadership exercises.

The assignment of teachers to programme districts and individual schools is conducted in the latter half of the training camp. The aim is to achieve a balance in the following dimension across districts: gender, religion, and STEM/humanity majors. The majority of teachers come from Java. However, for those who are not from Java, the programme favours teachers from eastern Indonesia for assignments in the western region and vice versa. Indonesia Mengajar does not take the teachers' personal assignment preferences into account, and the teachers take their district and school assignments as given.

Headmasters in the programme schools assign the teachers to teach students either as homeroom teachers or across grades as subject teachers. In the afternoon, many give extra lessons to students, teach at nearby secondary schools, or hold Quran reading classes. During their year-long tenure at the assigned school, the organization also charges individual teachers to provide training to other teachers and engage in education advocacy with local stakeholders.

Table 4 shows that half of the first cohort teachers were homeroom teachers, while the other half were subject teachers. While Indonesia Mengajar teachers had frequent contact with students of all grades, their

FIGURE 1
Districts where Indonesia Mengajar Sent Teachers in 2010–15 (Cohorts 1–10)

SOURCE: Indonesia Mengajar website.

TABLE 4
Indonesia Mengajar Teacher Activities, Cohort 1

Activities	*No. of Teachers*	*%*
Home teacher	26	51%
Grade 2	3	6%
Grade 3	5	10%
Grade 4	5	10%
Grade 5	12	24%
Grade 6	7	14%
Subject teachers any grade	25	49%
Any grade 6 subject	24	47%
Math grade 6	11	22%
Indonesian grade 6	4	8%
Science grade 6	6	12%
After-hours Grade 6 lessons		
Grade 6 home teachers	1	2%
Non-grade 6 home teachers	4	8%
Subject teachers	7	14%
Teachers' capacity-building events		
Within school	14	27%
Subdistrict clusters	20	39%
Teaching hours at non-programme schools		
Other elementary	3	6%
Junior high schools	2	4%
Senior high schools	3	6%
Total cohort 1 IM teachers	51	

NOTES: Tabulation of cohort 1 Indonesia Mengajar teacher activities. Data from Indonesia Mengajar operation records.
SOURCE: Author's calculations.

interactions with sixth-grade students merit further detail. Indonesia Mengajar teachers who taught across grades were often assigned grade six for the specific subjects that they were teaching, while homeroom teachers for grades one to five often taught multiple classes simultaneously (including grade six) because they substituted absent teachers. Beyond regular school hours, many Indonesia Mengajar teachers also provide afternoon lessons for grade six students in preparation for the exit examination. Overall, more than three-fifths of them interacted with students in grade six during scheduled instruction time, but a higher proportion could impact these students in practice.

3. Empirical Strategy

3.1 Regression Specification and Data

This study estimates the impact of the Indonesia Mengajar programme using a difference-in-difference approach. Essentially, it compares treated and control schools before and after programme implementation. The identification in this approach relies on the assumption of parallel trends (i.e., that outcome trends would be similar in both treated and comparison schools in the absence of treatment). The treated group consists of schools receiving the first cohort of Indonesia Mengajar teachers. The control group is a mixture of schools receiving Indonesia Mengajar teachers after the first cohort and other primary schools near the treated school that did not receive such teachers.

The empirical strategy leverages the unsynchronized timing between primary students' grade six exit examination and the programme teacher deployments. Indonesian primary school students sit for an exit examination at the end of their sixth grade, which usually takes place in May. In 2011, this examination took place two months before the second Indonesia Mengajar deployment in July, and grade six students in comparison schools where Indonesia Mengajar was to send the second cohort remained unexposed to programme teachers. Meanwhile, students in the treatment schools had been exposed to the programme since November 2010, which allows us to interpret the resulting estimates of the programme's impact after six months.[6]

The basic regression specification is as follows:

$$Score_{st} = \alpha + \sum_t \beta_t \, \mathrm{IM}_s \times \mathrm{year}_t + \gamma \, \mathrm{IM}_s + \sum_t \delta_t \, \mathrm{year}_t + \varepsilon_{st} \tag{1}$$

where $Score_{st}$ is the school s's examination score in year t, IM_s is a dummy variable for the treatment schools where Indonesia Mengajar sent their first cohort teachers, and year_t is a set of year dummy with 2010 as the omitted year. Our coefficient of interest is β_{2011}, which represents the impact of exposure to Indonesia Mengajar teachers at programme schools.

The dataset for this analysis comes from the Indonesian Ministry of Education's 2008–11 records. Because the dataset has a panel structure, we can estimate an alternate specification with fixed effects, as follows:

$$Score_{st} = \alpha + \sum_t \beta_t \, \mathrm{IM}_s \times \mathrm{year}_t + \mathrm{schoolFE}_s + \delta_t + \varepsilon_{st} \tag{2}$$

The inclusion of school fixed effects allows us to adjust for characteristics that do not vary with time, but which could influence the outcomes, such as location-specific characteristics. The estimates from this equation will be the preferred specification throughout the analysis. The standard errors are clustered two-way at the school level and the year level (Cameron, Gelbach, and Miller 2010).

The dataset recorded the scores for examinations that covered materials from grades four to six. The examinations were not identical across regions because they were prepared by committees at the provincial level. In finalizing the examinations, provincial committees were required to use questions from the national test bank and locally written tests in a twenty-five/seventy-five proportion. Nevertheless, the mathematics examinations were likely to be comparable across regions for two reasons. First, the mathematics curriculum in grades four to six was structured with significant overlaps in topics across grades (e.g., fractions and integer operations are progressively covered every year in the January semester). This consolidates the possible range of topics for the examination into just several core topics. Furthermore, the committees were also bound by a legal guide in the form of a ministerial decree that explicitly stipulates the competencies to include in the examination (see, e.g., Education Ministry Decree No. 2/2011). These provided assurances on the comparability of the mathematics examinations across regions and years.[7]

The Ministry dataset records the minimum, average, and maximum mathematics scores for each school. These scores should reflect the ability of the weakest student in class, the average student, as well as the strongest student. These details allow an investigation of the impact of programme teachers on students with various ability levels.

3.2 Classroom Instructions

If there are other changes to treatment schools concurrent with the programme implementation, then this would undermine the interpretation of the estimated coefficient of interest as the impact due to the Indonesia Mengajar teachers. Here the study examines a possible scenario in which the programme led to existing teachers increasing their efforts after the Indonesia Mengajar teachers arrived. This could be triggered by the programme's high-visibility status, which brought more awareness and supervision from the headmaster to other teachers or even from the subdistrict superintendents. In this case, the estimated effects are still arguably a result of the programme, although these would be indirect effects instead of being directly due to the Indonesia Mengajar teachers.

To separate the effect of direct instruction, this paper uses Indonesia Mengajar organizational reports that recorded the teaching assignments for all first cohort teachers. It estimates the coefficients for an alternate specification where the Indonesia Mengajar exposure dummy variable is interacted with whether the Indonesia Mengajar teachers have a scheduled classroom instruction time on mathematics, Indonesian, or science (other two-way interaction terms that are collinear are collapsed).

$$Score_{st} = \alpha + \sum_t \phi_t \text{IM}_s \times \text{Y6subject}_s \times \text{year}_t + \sum_t \beta_t \text{IM}_s \times \text{year}_t + \text{schoolFE}_s + \delta_t + \varepsilon_{st} \quad (3)$$

In this specification, Y6subject_s is the dummy variable for scheduled instruction time for grade six in one of the three subjects. The variable Y6subject_s takes on a value of one if the Indonesia Mengajar teacher in school s is teaching mathematics either as a homeroom teacher or a subject teacher, and zero otherwise, and is reported in the regression table as Y6Math. Following this definition, about one-third of the treated schools have a scheduled instruction time for mathematics (Table 4). Indonesian and science instruction are constructed in the same way, and are reported as Y6Indonesian and Y6Science, respectively. As before, the 2010 year is the omitted category for the year dummies.

The coefficient ϕ_{2011} allows us to assess the effect of scheduled classroom instructions directly from Indonesia Mengajar teachers beyond the effect of being in a school where an Indonesia Mengajar teacher has been assigned. Specifically for mathematics instruction, this study compares treated schools where the Indonesia Mengajar teacher taught mathematics and treated schools where the Indonesia Mengajar teacher did not teach mathematics. The estimates that we recover will be equivalent to running the specification in equation (2) with the Y6math_s dummy in place of the IM_s for the subsample of treated schools, while avoiding the loss of precision from discarding observations in the study sample. The differential impact of scheduled instruction time is thus identified under the assumption of parallel trends for schools assigned to Indonesia Mengajar teachers who taught mathematics and schools receiving Indonesia Mengajar teachers who did not teach mathematics. The estimation results are discussed in the next section.

4. Results

4.1 Main Results

This study finds that exposure to Indonesia Mengajar teachers is associated with higher average mathematics scores for their students: the coefficient β_{2011} for the mean score is 0.14 points, and is statistically different

TABLE 5
Impact of Exposure to Indonesia Mengajar Programme on
Grade Six Mathematics Exit Examination Score

	(1)	*(2)*	*(3)*
	Avg math	*Min*	*Max*
IM x 2008	0.11	0.08	0.02
	(0.16)	(0.16)	(0.18)
IM x 2009	0.06	0.16	0.04
	(0.09)	(0.12)	(0.07)
IM x 2010	0	0	0
	(.)	(.)	(.)
IM x 2011	0.14*	0.20***	0.08
	(0.05)	(0.02)	(0.13)
control mean	4.8	3.7	6
control SD	0.9	1	1.3
N	825	825	825

NOTES: This table reports the estimates of equation (2) based on exit examination data from the Ministry of Education 2008–11. The outcomes of interest are mean, minimum, and maximum mathematics scores from the exit examination in a given year. Control mean and SD is the average score and its standard deviation among non-treatment schools in 2010. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered by school and year.
SOURCE: Author's calculations.

from zero at a 10 per cent significance level (Table 5, column 1). Compared to the 0.9 points standard deviation of mean score among control schools in 2010, the estimated effect for mean mathematics score is equivalent to a 0.16 standard deviation.

Indonesia Mengajar teachers seem to be particularly effective in teaching the weakest students, raising the minimum score by 0.20 points (0.20 standard deviation, column 2). Meanwhile, the estimated effect on the maximum examination score is positive at 0.08 points, but is lower than the effect on the average score and not significantly different from zero (column 3).

The impact on mathematics scores for the Indonesia Mengajar programme lines up with benchmark estimates from TFA, which is the most evaluated programme of its kind (Turner et al. 2018). The most recent randomized evaluation of the programme shows that students of TFA teachers in grades one and two perform significantly better in mathematics by 0.16 standard deviations (Clark and Isenberg 2020). This finding is in line with earlier randomized evaluation results in Decker et al. (2004), which report a better performance of TFA students in mathematics by 0.15 standard deviations. In middle and high school, Clark et al. (2013) report that TFA teachers increased their students' mathematics achievements by 0.07 standard deviations. In England and Wales, a difference-in-difference evaluation of Teach First shows positive and statistically significant improvements in the students' General Certificate of Secondary Education (GCSE) scores by 0.05 and 0.08 standard deviations in years two and three of TF roll-out (Allen and Allnutt 2017).

It is worth noting that the aforementioned TFA and TF evaluations measured the impact on students after a more prolonged exposure than the Indonesia Mengajar teachers in this study. Fellows with the TFA and TF programmes typically teach for two years, while Indonesia Mengajar teachers are only contracted to teach for a year. In practice, for this study, the students were observed just six months after the start of Indonesia Mengajar teachers' deployment to treated schools (November 2010 to May 2011). Suppose students benefit from more exposure to Indonesia Mengajar teachers with stronger academic ability. In this case, the estimates in this study may understate the total learning gains the students in treated schools achieved during the entire duration of the programme.

This was the case for an intervention in India that provided government schools with contract teachers (*balsakhi*) to work with students who were falling behind their peers. An evaluation of this intervention in the cities of Vadodara and Mumbai showed that the remedial education programme increased average test scores in the treatment schools by 0.14 standard deviations in the first year, and 0.28 in the second year (Banerjee et al. 2007). More generally, McEwan's (2015) meta-analysis for education interventions in developing countries highlighted the potential of using contract teachers to improve student achievements. In his review, he identified eight studies with a contract or volunteer teacher intervention, with a mean effect size of 0.10 standard deviations on student achievements. However, he noted that these interventions often implied a reduction in class size, and it is still not clear whether smaller classes are a necessary condition for the effectiveness of contract teachers.

The programme's effects on the average student and the highest scoring student do not attain precision at the conventional statistical significance level of 5 per cent, which may be caused by the Indonesia Mengajar dummy variable recording student exposure with noise. While more than 60 per cent of Indonesia Mengajar teachers had a class schedule with grade six students in any subjects, not all of them did.[8] The next subsection explores the role of scheduled classroom instructions.

4.2 Classroom Instructions

The estimated effects on the average and minimum mathematics examination scores appear to be driven by classroom instructions from Indonesia Mengajar teachers. Table 6 shows the estimated coefficients for the interaction with a dummy variable for mathematics instruction. The magnitude of the interaction terms' coefficients suggests that classroom instructions drove the main result. The mean score increased by 0.25 points (significant at the 10 per cent level), the minimum score by 0.40 points (at the 5 per cent level), and the maximum score by 0.29 points (not statistically significant). For the weakest students, this is a meaningful increase. This increase may bring their score from an average of 3.7 to above a 4.0 mark, which is the guideline threshold for graduation as outlined in the ministry regulation.[9]

The higher impact on the weaker students' test scores is consistent regardless of which subject the Indonesia Mengajar teachers taught them. When the students were exposed to the Indonesia Mengajar teachers through classroom instruction in Indonesian, the minimum mathematics score increased by 0.74 points, which is higher than the estimated effect for the mean score at 0.08 points (not significant, Table 7). For Indonesia Mengajar teachers teaching science (Table 8), the minimum mathematics score has the biggest estimated effect of all, with an increase of 1.04 points, which is again higher than the mean score with an increase of 0.72 points. All the estimated effects for minimum mathematics score are significantly different from zero at the 5 per cent level. None of the estimates for maximum mathematics scores is statistically significant.

These results suggest that the students benefited from the use of mathematics concepts in science lessons and more intensive use of the national language. Nationwide, only one in four individuals uses Indonesian at home, and most of the population speaks local languages at home. Because the examinations

TABLE 6
Impact of Indonesia Mengajar Exposure on Mathematics Score by Classroom Instructions in Mathematics

	(1)	*(2)*	*(3)*
	Avg math	*Min*	*Max*
IM x 2008	0.1	–0.01	0.15
	(0.18)	(0.2)	(0.2)
IM x 2009	0.1	0.08	0.13
	(0.13)	(0.15)	(0.09)
IM x 2010	0	0	0
	(.)	(.)	(.)
IM x 2011	0.05	0.07	–0.01
	(0.07)	(0.04)	(0.17)
IM x Y6 Math x 2008	0.05	0.28	–0.42
	(0.32)	(0.27)	(0.34)
IM x Y6 Math x 2009	–0.11	0.27	–0.28**
	(0.12)	(0.21)	(0.05)
IM x Y6 Math x 2010	0	0	0
	(.)	(.)	(.)
IM x Y6 Math x 2011	0.25*	0.40**	0.29
	(0.1)	(0.12)	(0.27)
2010 control mean	4.8	3.7	6
2010 control std dev	0.9	1	1.3
N	825	825	825

NOTES: This table reports the estimates of equation (3) based on exit examination data from the Ministry of Education 2008–11 and Indonesia Mengajar operational records. The outcomes of interest are mean, minimum, and maximum mathematics scores from the exit examination in a given year. Control mean and SD is the average score and its standard deviation among non-treatment schools in 2010. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered by school and year.
SOURCE: Author's calculations.

were conducted in Indonesian, this could suggest that comprehension problems underlie the students' poor mathematics scores, and instructions that improve comprehension can boost performance.

5. Conclusion

Does an alternative teacher placement programme that sends college graduates with strong academic and leadership backgrounds to teach rural primary schools impact student outcomes? This paper compares the mathematics score between programme and control schools using a difference-in-difference strategy using the national exit examination dataset from the Ministry of Education. It finds that teachers deployed by the Indonesia Mengajar programme raised the mean score by a 0.16 standard deviation, which was

TABLE 7
Impact of Indonesia Mengajar Exposure on Mathematics Score by Classroom Instructions in the Indonesian Language

	(1)	*(2)*	*(3)*
	Avg math	*Min*	*Max*
IM x 2008	0.15	0.02	0.18
	(0.16)	(0.17)	(0.18)
IM x 2009	0.03	0.07	0.07
	(0.09)	(0.13)	(0.08)
IM x 2010	0.00	0.00	0
	(.)	(.)	(.)
IM x 2011	0.12	0.05	0.14
	(0.06)	(0.03)	(0.14)
IM x Y6 Indonesian x 2008	–0.17	0.27	–0.78
	(0.45)	(0.40)	(0.44)
IM x Y6 Indonesian x 2009	0.16	0.47	–0.15
	(0.23)	(0.31)	(0.09)
IM x Y6 Indonesian x 2010	0.00	0.00	0
	(.)	(.)	(.)
IM x Y6 Indonesian x 2011	0.08	0.74**	–0.33
	(0.13)	(0.13)	(0.36)
2010 control mean	4.8	3.7	6
2010 control std dev	0.9	1.0	1.3
N	825	825	825

NOTES: This table reports the estimates of equation (3) based on exit examination data from the Ministry of Education 2008–11 and Indonesia Mengajar operational records. The outcomes of interest are mean, minimum, and maximum mathematics scores from the exit examination in a given year. Control mean and SD is the average score and its standard deviation among non-treatment schools in 2010. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered by school and year.
SOURCE: Author's calculations.

significant at the 10 per cent level. The weakest students benefited most from exposure to the programme, with an increase of 0.20 standard deviation, which is more precisely estimated at the 5 per cent level. The estimated effects are higher for the weakest students who had classroom time with programme teachers, with bigger gains from Indonesian and science instruction of up to 1.04 points.

This study provides new evidence on programmes that are modelled on a Teach for America programme from a developing country. TFA-style programmes have spread globally based on the idea that they are an effective intervention to address achievement gaps in rural or disadvantaged areas. However, virtually no rigorous evaluation has been done in countries other than the US and the UK. This study presents the first attempt to estimate the causal impact of such programmes outside the original two countries. The findings from this evaluation suggest that, especially for the weakest students in rural schools, improvements in their teacher quality may lead to meaningful academic improvements in their achievements. At the same

TABLE 8
Impact of Indonesia Mengajar Exposure on Mathematics Score by Science Classroom Instruction

	(1)	(2)	(3)
	Avg math	Min	Max
IM x 2008	0.26	0.23	0.05
	(0.16)	(0.19)	(0.15)
IM x 2009	0.09	0.15	0
	(0.10)	(0.12)	(0.06)
IM x 2010	0.00	0.00	0
	(.)	(.)	(.)
IM x 2011	–0.02	–0.03	–0.03
	(0.06)	(0.04)	(0.17)
IM x Y6 Science x 2008	–0.64	–0.67	–0.12
	(0.42)	(0.29)	(0.59)
IM x Y6 Science x 2009	–0.12	0.06	0.19
	(0.19)	(0.36)	(0.18)
IM x Y6 Science x 2010	0.00	0.00	0
	(.)	(.)	(.)
IM x Y6 Science x 2011	0.72**	1.04**	0.5
	(0.16)	(0.18)	(0.27)
2010 control mean	4.8	3.7	6
2010 control std dev	0.9	1.0	1.3
N	825	825	825

NOTES: This table reports the estimates of equation (3) based on exit examination data from the Ministry of Education 2008–11 and Indonesia Mengajar operational records. The outcomes of interest are mean, minimum, and maximum mathematics scores from the exit examination in a given year. Control mean and SD is the average score and its standard deviation among non-treatment schools in 2010. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered by school and year.
SOURCE: Author's calculations.

time, the low level of baseline achievements may have been driving the positive results here. Finally, the education policy community would benefit from more empirical studies on similar programmes.

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This project benefited from discussions with Aisy Ilfiyah, Ajeng Tri Handini, Frina Lin, Marliyanti, and Patrya Pratama, as well as participants of the Development Reading Group at Boston University. I am grateful to Galih Ramadian Nugroho Putra, Hikmat Hardono, Lizara Patriona, Subhanudin Husen, and the leadership in Indonesia Mengajar for facilitating various data access. The views expressed in this paper are those of the author and should not be attributed to the various individuals and organizations acknowledged above.

NOTES

1. Disclosure: The author was a teacher in the Indonesia Mengajar programme, cohort V (November 2012 to January 2014).
2. This unintuitive relationship between low teacher competency score and their education degree could be driven by several characteristics of the higher education system in Indonesia. First, education college degrees are predominantly offered by private institutions, which on average are of lower quality than public universities. Wicaksono and Friawan (2011) noted that about 75 per cent of PhDs in Indonesia are concentrated in just four public universities (UI, ITB, UGM, and IPB, which are all located in Java and are major contributors to Indonesia Mengajar teacher recruits). Another factor is student sorting. High school graduates with a high ability sort into top universities and lower quality students sort into education majors, which have a less strict screening process. The sorting effect may also be exacerbated by the differential survival rates of education majors by ability. A high-performing college student with an education major may choose to exit the field for a better paying job than a low-paying entry-level teaching job (Chang et al. 2014).
3. *Pengerahan Tenaga Mahasiswa*/College Student Send-down.
4. Agreement by the district depended on the cooperation of the district's education office but in early cohorts the district head (Bupati) and the head of district education office would be honoured with a reception at the Vice President's office before the deployment of the Indonesia Mengajar teachers to the destination districts. Then Vice President Boediono was a personal supporter of the programme.
5. Initially, there were fourteen districts in the first year (2010–11). However, conflict between the state military and the Aceh separatist movements forced the programme's relocation from Aceh Utara to Musi Banyuasin and Muara Enim in South Sumatra. In November 2012, Indonesia Mengajar re-added Aceh Utara and added Banggai to its programme districts, bringing the total to seventeen districts.
6. While a longer-term evaluation with a panel data that extends beyond 2011 would also be of interest, the author does not have access to this dataset.
7. The comparability is harder to establish for examinations in other subjects such as the Indonesian language and science. The 2011 Ministerial Decree listed 34 to 43 per cent more competencies to cover in the examination for the subjects of Indonesian language and science (thirty and twenty-six, respectively, compared to seventeen for mathematics). These stemmed from heavier loads in its grade 4 to 6 curriculum with twenty-four and twenty-seven competencies to cover for Indonesian and science without overlaps across grades, whereas mathematics only has twenty-one competencies with significant overlaps.
8. An ideal evaluation using the same difference-in-differences approach for this programme would prospectively collect grade-level measures of academic ability using the same test for students in both treated and comparison schools. The econometrician could then estimate the programme effect while taking into accounts the difference in teacher assignments across treated schools (cf. Banerjee et al. 2007). Unfortunately, the Indonesia Mengajar programme did not embed such an evaluation plan in their roll-out and the ministry only collected school-level statistics for the exit examination for grade six.
9. Education Minister Decree 59/2011 stipulated that secondary school students can graduate if they score at least 4.0 in their final score in all of their examination subjects. The final score is a weighted average of the examination score (60 per cent) and semester report cards (40 per cent).

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ASEAN Education Cooperation

An Assessment of Education Divide and Measuring the Potential Impact of Its Elimination

Sanchita Basu Das and Badri Narayanan

Quality education is a key determinant for ASEAN's aspiration to be a single market and production base and to attract foreign investment. However, the region is characterized by an education divide in terms of quality and output, and this is likely to increase in the post-COVID-19 period. A simulation, modelling a productivity increase in the education sector through an increase in the Human Development-Education Index for lagging ASEAN countries to the level of Singapore (benchmark country), shows that GDP, exports and consumption are poised to go up much more for the countries that lag farther behind Singapore in their education quality. This increases ASEAN countries' potential to achieve outcomes from regional integration and hence provides an incentive to pay more attention to education cooperation, particularly by setting regional targets for improved education quality and output at the national level while linking education more intrinsically to ASEAN economic cooperation.

Keywords: Export efficiency, governance performance, stochastic frontier gravity model, Vietnam, East Asia, ASEAN, education, economic development, HDI.

1. Introduction

A development divide has long characterized ASEAN regional integration. Soon after the accession of the last ASEAN member in 1999, the region was feared to be divided into a two-tier structure between the old ASEAN members (i.e., Brunei Darussalam, Indonesia, Malaysia, the Philippines, Singapore and Thailand) and the newer ones (i.e., Cambodia, the Lao PDR, Myanmar, and Vietnam) (Severino

Sanchita Basu Das is Economist at the Regional Cooperation and Integration Division of the Economic Research and Regional Cooperation Department of the Asian Development Bank (ADB), 6 ADB Avenue, Mandaluyong City 1550, Metro Manila, Philippines; email: sbasudas@adb.org

Badri Narayanan is Senior Economist at the School of Environmental and Forestry Sciences, University of Washington, Seattle, Senior Fellow at the European Centre for International Political Economy, and Courtesy Faculty Member, Oregon State University, 21746 SE 3rd Pl, Sammamish, WA 98074, USA; email: badrig@uw.edu

2007). The divide was cited not only for per capita income but also for the level of human development, availability of transport and digital infrastructure. Also, gaps in institutional and human capacities make it difficult for all ASEAN countries to raise their productive ability together. Those gaps constrain their ability to develop a single market and production base, as espoused in the ASEAN Economic Community (AEC) Blueprint[1] (Salazar and Basu Das 2007).

COVID-19 has further increased this disparity among ASEAN countries. The blow dealt by the pandemic was felt differently by the ten economies across all indicators of COVID-19 (i.e., number of infections, deaths and tests conducted). ASEAN countries employed different ways to contain the spread of the virus, which could be observed in the form of mobility restrictions and duration of containment and control measures. There were also significant differences in the size of budgetary support, the pace of utilization of the additional resource, focus areas of government expenditure, and financial assistance to businesses (Lee, Negara, and Sambodo 2020). Moreover, the pandemic highlighted some fundamental issues in most of these economies, contributing to the differences in terms of readiness. For example, around half of ASEAN countries suffer from a weak healthcare system, including Cambodia, the Philippines, the Lao PDR and Indonesia. There is a lack of uniformity in digital accessibility across ASEAN residents, and more than 50 per cent of the ASEAN population remains offline. This became a challenge during the pandemic, as people in ASEAN did not have equal access to information and even suffered in areas of their daily livelihood (UN 2020).

COVID-19 exposed vulnerabilities in the education sector of ASEAN countries as well. The sector plays a pivotal role in building AEC. The regional documents in ASEAN, including the ASEAN Socio-Cultural Community and ASEAN Education Work Plan, identify education as a fundamental public good and highlight its importance for improved human development capacity and mobility of skilled labour in the region. The ASEAN Work Plan on Education 2016–20 aimed at enhancing access to and the quality of basic education[2] and increasing the use of ICTs for all levels of education (ASEAN Document n.d.). These have implications over time for acquiring advanced skills and improving employment prospects. These also have implications for enhanced economic competitiveness in terms of increasing trade and investment, leading to ASEAN's greater engagement with the global economy. Despite its importance, ASEAN countries face an education divide. The gap, although limited in terms of enrolment rate, is relatively higher when considering quality, measured in terms of pupil-student ratio, use of ICTs, infrastructure, and others. More significant differences exist in learning levels, which are reflected in international test scores (such as PISA) and the UNDP Human Development Index.

COVID-19 has exacerbated the education quality divide. The pandemic resulted in school closures in ASEAN countries for a prolonged period, resulting in students' learning losses. ADB (2021) estimates that students in Southeast Asia have lost, on average, more than 35 per cent of a year of learning,[3] more than a loss of 29 per cent for developing Asia. Learning losses vary across the ASEAN countries, depending on the duration of school closures and uneven access to digital devices among the population. As learning losses will reduce future productivity and earnings, estimates show a loss of around US$180 or a 2.4 per cent decline in expected annual earnings for students affected by school closures in developing Asia (ADB 2021a).

Although the school closures led to a transformation from traditional classroom teaching to a virtual one, there are no estimates yet on how far this shift has managed to mitigate the learning losses. Much depends on the readiness of e-learning methods, including e-books, IT tools, and other study materials. In many cases, e-learning presented new challenges, as both students and teachers struggled with access to digital infrastructure and devices, as well as knowledge of technical skills.

This paper discusses the state of the education divide in ASEAN and measures the importance of education quality to economic development to increase the possibility of attaining economic outcomes from stronger regional cooperation. The paper provides policy recommendations drawn from the analysis

and building on regional documents and studies. The past literature has looked into various studies to present the importance of education to human capital, innovation and economic growth. Much discussion on ASEAN education has been restricted to higher and technical education. This paper fills this gap in the research by delving deeper into the ASEAN education divide and assessing its role with other sectors of the economy that contributes to economic integration.

The remainder of the paper is organized as follows. Following the introduction, the next section presents the literature review of the role of the education sector in economic growth and development. The third section elaborates on the education divide in ASEAN using selected indicators divided into three categories (quantity, quality and output). It also shows the differences in the duration of school closures and learning losses during COVID-19. The subsequent section undertakes a simulation exercise to measure the potential impact of closing the education divide in ASEAN. It discusses the impact of the education sector on other sectors of these economies to understand the implications. The fifth section reviews the current regional cooperation document in the education sector in ASEAN and presents the case of education cooperation in the European Union. Policy lessons are drawn in the final section to conclude the paper.

2. Literature Review

The literature review covers three aspects: (a) education and human capital; (b) education and trade, investment and technology; and (c) ICT-improved access to education. Education has a robust relationship with building human capital that is of inherent value. There is a direct correlation between educated people and higher productivity. Education generates higher-skilled people who increase the absorption capacity of technology from more developed to less developed economies. Education is also useful for providing positive social outcomes (Barroa and Lee 2013). There is also evidence of a strong association between higher cognitive skills and economic growth (Hanushek and Woessmann 2008). It is estimated that one additional year of school education generates a rate of return of about 5–8 per cent per year for an individual (Patrinos 2016).

Education enables countries to improve their comparative advantage in new product categories. In fact, quality primary education strongly correlates with countries' development of their comparative advantage in products they are already producing (Felipe, Jin, and Mehta 2021). It is also a core determinant for countries following an FDI-led growth strategy (Brooks et al. 2010). Because an adequate education system is reflected in better human capital (Hanushek and Kimko 2000), foreign investors are often attracted by the quality and relevance of education that matches their industry requirements in developing countries. Attainment of adequate education—with better quality human resources—is essential for technology adoption and diffusion and the resulting productivity increase (Kim and Terada-Haglwara 2010). This is observed for both developed and developing countries: Asian economies that grew quickly acquired well-educated human resources.

Education affects the nature and growth of exports. The level and quality of education in a country's workforce (especially in developing countries) influence the nature of its factor endowments and, as a result, the composition of its trade (Ozturk 2001). According to Grossman and Helpman (1989), knowledge accumulation and trade go hand in hand, as one enhances the other, especially through imports (Ben-David and Loewy 1995). The quality of education appears in differences in countries' growth trajectories. Using a dataset of sixty-two countries over ten-year intervals from 1960 to 2000, Jamison, Jamison, and Hanushek (2007) concluded that quality of education has a positive effect on economic growth. They used the two variables to assess education quality—Mathematics test scores (EQTEST) and US labour market returns to education by country of immigrant origin (EQBT)—and showed that a 1 standard deviation rise in test scores led to an increase in per capita GDP growth by 0.5–0.9 percentage points.

There are also studies showing that improved basic education enables individuals to be more aware of innovation at an early stage of development and more capable of managing new technologies for better economic outcomes. For example, Foster and Rosenzweig (1996) have shown empirically that access to basic education increased farmers' capabilities of moving from traditional to new farming techniques and further to non-farming activities.

The COVID-19 pandemic has had a significant impact on education. Governments around the world put a stop to face-to-face teaching and moved to online learning methods. This implies lost opportunities for students to learn crucial social, cognitive, and emotional skills, along with the chance that they may forget what they have learnt in the past (Cooper et al. 1996). As learning at a young age has implications for students' ability to acquire advanced skills in the future, missed learning opportunities are likely to put the skill attainment level at risk going into the future (Meyers and Thomasson 2017). Schools in many countries have pivoted to digital classrooms, but the benefits from such shifts depend on Internet availability and accessibility among the general population. A cross-country empirical analysis of 117 economies—a mix of emerging and advanced economies—shows that greater Internet access does mitigate some of the damage inflicted by the COVID-19 pandemic, and it further stipulates that improved Internet access is likely to mitigate some of the economic loss due to the pandemic. Estimates show that improving Internet access per population from the average for an emerging market (52.9 per cent) to that of an advanced economy (87.8 per cent) will help to reduce the former's growth slowdown by half (ADB 2021).

ASEAN acknowledges the importance of education in enhancing human capital in the region and has accordingly created institutions to support education cooperation (Dang 2017). These came into play simultaneously as ASEAN embarked on its initiative of the ASEAN Free Trade Area (AFTA), and later the ASEAN Economic Community, to enhance economic competitiveness. However, much attention is paid to ASEAN higher education and vocational training, marginalizing discussion of the role of basic education in higher-level learning and skills acquisition. Individual ASEAN countries also recognize the role of education in driving economic growth. While all countries have plans to improve their education system and quality, educational quality differs and remains uneven across ASEAN countries (Maneejuk and Yamaka 2021).

3. State of Education Divide in ASEAN

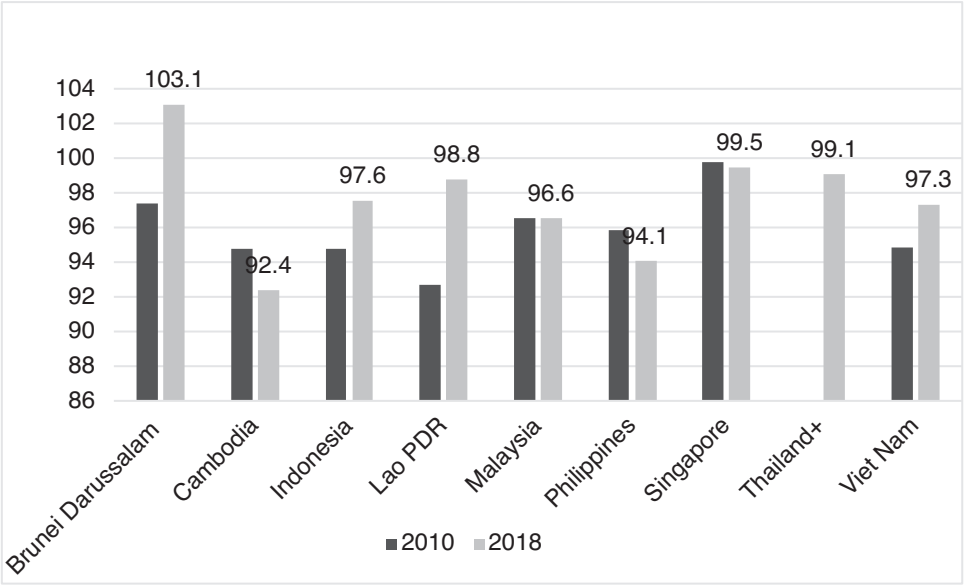
This section looks at the educational divide through three lenses: quantity, quality and output. It then presents the gaps in access to education and technology among ASEAN countries that increased the divide further during the COVID-19 pandemic.

3.1 Quantity

Figures 1A and 1B show the net enrolment ratios in ASEAN countries in primary and secondary school education. This ratio has improved over time between 2010 and 2018 for both education categories. In 2018, while the ratio remained relatively high for primary schools, there was wide variation in enrolment in secondary education. Other than Singapore, Malaysia and Vietnam, most ASEAN members' enrolment ratio is below 90 per cent.

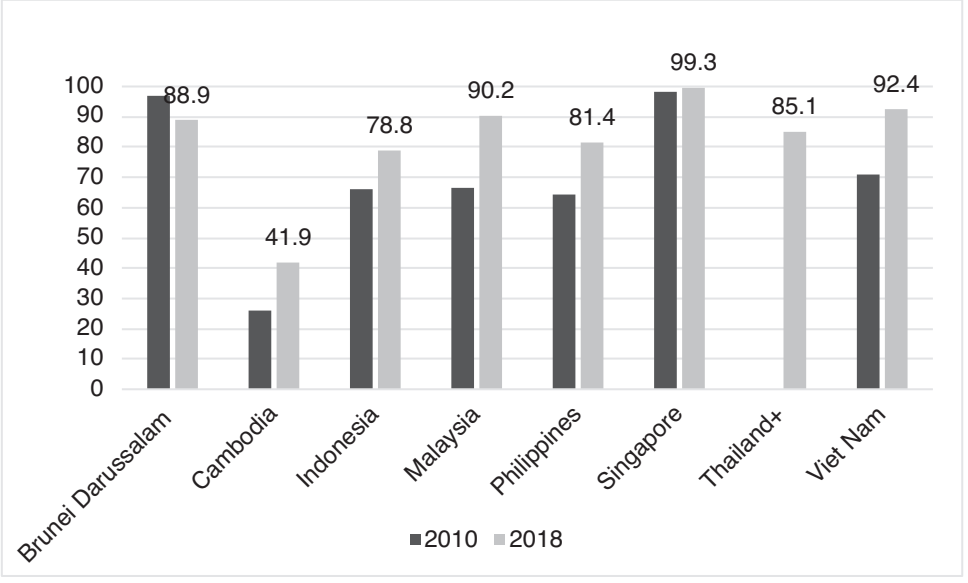
Figure 2 records students' completion rate for primary and lower secondary educational programmes, which varies across ASEAN members, although the disparity is greater for lower secondary schools. Except for Brunei Darussalam, Singapore and Vietnam, the completion rate for primary and lower secondary educational programmes remains low in one or both categories.

FIGURE 1A
Net Enrolment Ratio in Primary School (in Percentage)



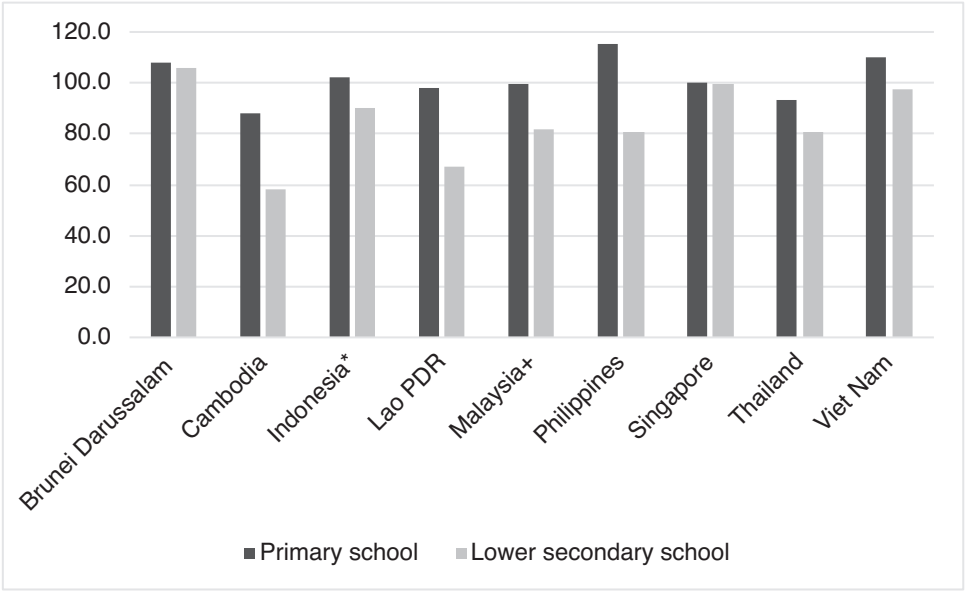
NOTE: Thailand data only available for 2018.
SOURCE: ASEAN Statistical Yearbook 2020, The ASEAN Secretariat.

FIGURE 1B
Net Enrolment Ratio in Secondary School (in Percentage)



NOTE: Thailand data only available for 2018; no data available for the Lao PDR.
SOURCE: ASEAN Statistical Yearbook 2020, The ASEAN Secretariat.

FIGURE 2
Completion Rate, Total (% of Relevant Age Group), 2018



NOTE: Figures for Malaysia's primary school and Indonesia's lower secondary school from 2017.
SOURCE: World Development Indicators.

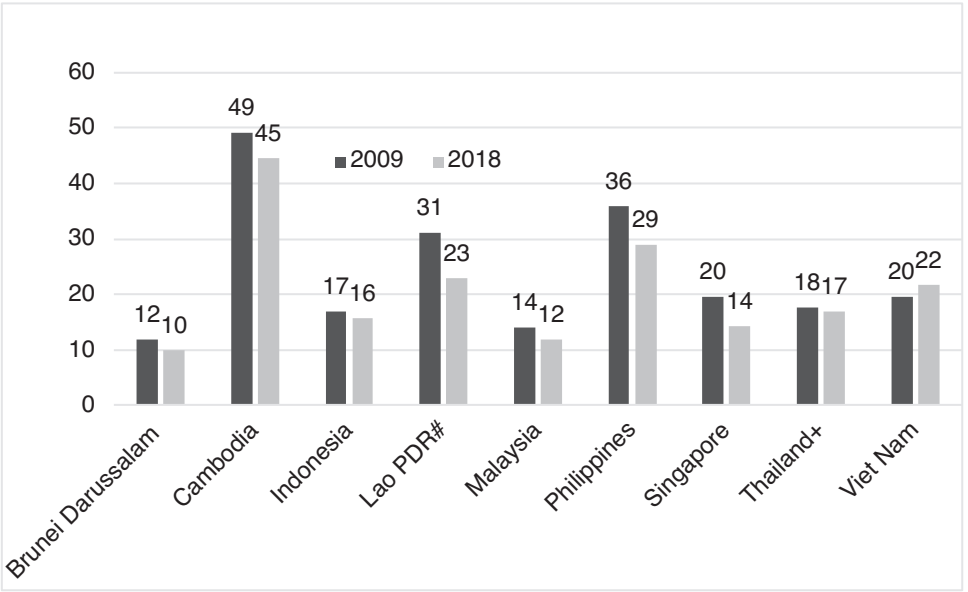
3.2 Quality

ASEAN countries face differences in the quality of the provision of basic education. Figures 3A and 3B show the student-teacher ratio in primary and secondary schools, which indicates the quality of education provision. During 2009–18, while the lowest ratios were observed in Brunei Darussalam, Malaysia, and Singapore, the ratios were relatively higher and greater than twenty for Cambodia and the Philippines. A higher ratio implies lower student access to a teacher, which in turn creates challenges for teachers to pay more attention to individual students, thus affecting student performance in the long run. The ratio of the spread of teachers over students has improved for most countries during this time.

With regard to school infrastructure, apart from Singapore and Brunei Darussalam, most ASEAN countries face shortages in school infrastructure. The lack of infrastructure is especially noticeable among less developed ASEAN members (Tullao et al. 2016). Table 1 shows that a sizeable proportion of primary schools in Indonesia, the Philippines, and Vietnam do not have access to round-the-clock electricity. There is also a gap among the countries regarding access to computers for educational purposes or even basic sanitation facilities.

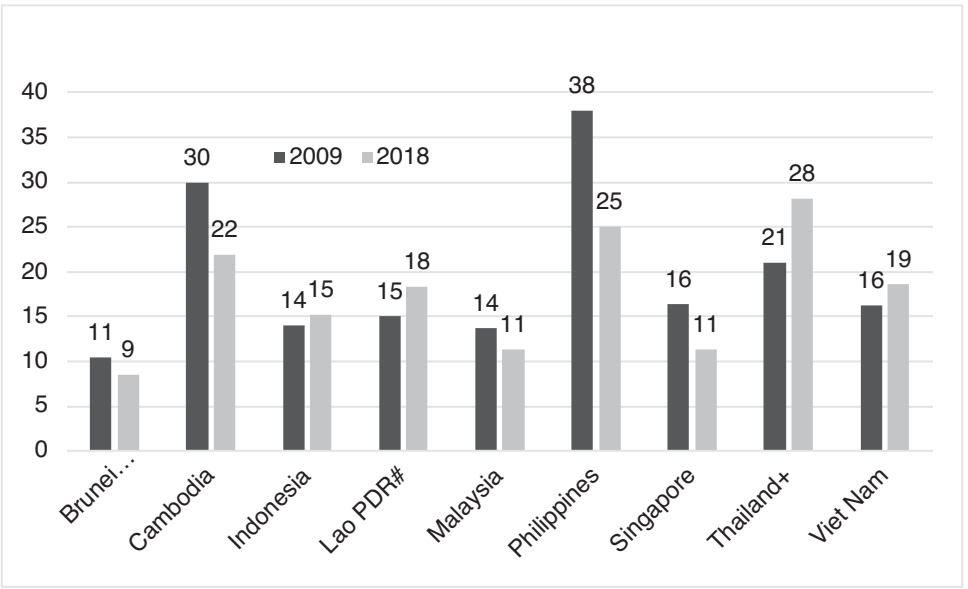
The use of ICT to enhance the delivery of education services has been made mandatory in many of the ASEAN countries. However, implementation has remained patchy in most countries due to a lack of resources. Tullao et al. (2015) enumerate the differences in the application of ICT in education systems in ASEAN countries. While Cambodia has made it compulsory to use ICT in education service delivery by putting it in its constitution, countries like Malaysia, Singapore and the Lao PDR have assigned a separate department within their education ministry the task to implement various technologies in public schools. The Philippines has mandated the use of ICT in all learning areas. Despite these initiatives,

FIGURE 3A
Pupil-Teacher Ratio in Primary School



NOTE: Data for Thailand from 2007 and 2015; latest data for the Lao PDR is 2016.
SOURCE: ASEAN Statistical Yearbook 2020, The ASEAN Secretariat.

FIGURE 3B
Pupil-Teacher Ratio in Secondary School



NOTE: Data for Thailand from 2007 and 2015; latest data for the Lao PDR is 2016.
SOURCE: ASEAN Statistical Yearbook 2020, The ASEAN Secretariat.

TABLE 1
Selected School Infrastructure Indicators in ASEAN Countries (Percentage)

	Electricity (2018)	*Computers for Pedagogical Purposes*	*Single-Sex Basic Sanitation Facilities*
Brunei Darussalam	100	97	100
Cambodia	—	—	68.7
Indonesia	93.6	41.1	51.6
Lao PDR	—	—	76.1
Malaysia*	100	81.7	100
Philippines	94.9	77.9	—
Singapore	100	100	100
Thailand	—	—	—
Vietnam	93	79.1	—

NOTE: Figures for Malaysia from 2017; —, data not available.
SOURCE: ASEANStats, ASEAN Secretariat.

implementation remains incomplete. All ASEAN countries have yet to ensure equal access to telecom, electricity, and the Internet. There is also a lack of budgetary resources provided for this particular part of education delivery. However, Malaysia and Singapore are relatively advanced in deploying ICT in their education sector. According to the UNDP Human Development Indicator dashboard for 2020, around 97 per cent of primary and 96 per cent of secondary schools in Malaysia have access to the Internet, which should be compared to the 61 per cent of secondary schools in Indonesia.

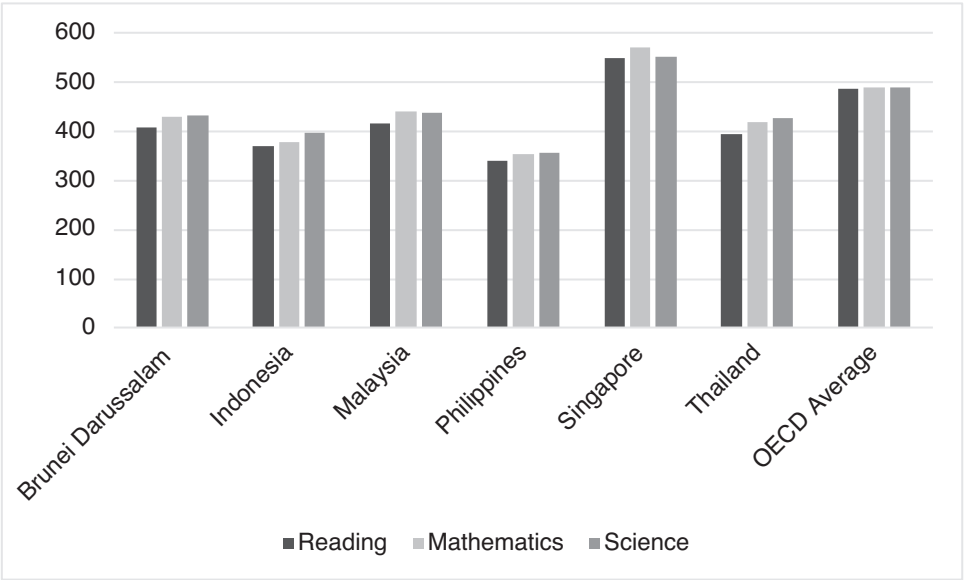
3.3 Output

Three indicators are presented here to assess the quality of education output: the Organization for Economic Co-operation and Development's (OECD) Programme for International Student Assessment (PISA), LAYS 2020, and the UNDP Human Development Report. In 2018, Singapore performed the best in terms of the PISA assessment (Figure 4), followed by Malaysia, Brunei Darussalam and Thailand, among the ASEAN countries that participated in the assessment, for all three assessed subjects (Reading, Mathematics, and Science). Most ASEAN countries performed poorly compared to all countries participating in the PISA assessment in 2018. For example, in reading competency, Malaysia ranked 56th, Brunei Darussalam 59th, Thailand 66th, Indonesia 72nd, and the Philippines 77th out of 78 countries. Singapore was the top performer, ranking second in all three assessed categories.

Figure 5 illustrates how Learning Average Years of Schooling (LAYS), which captures both quantity and quality of education, differs among ASEAN countries. As the indicators around quantity are relatively high, the differences in quality parameters define the variation between expected years in schooling and learning-adjusted years in school. The most significant difference appears in the Philippines, and the minor difference appears in Singapore.

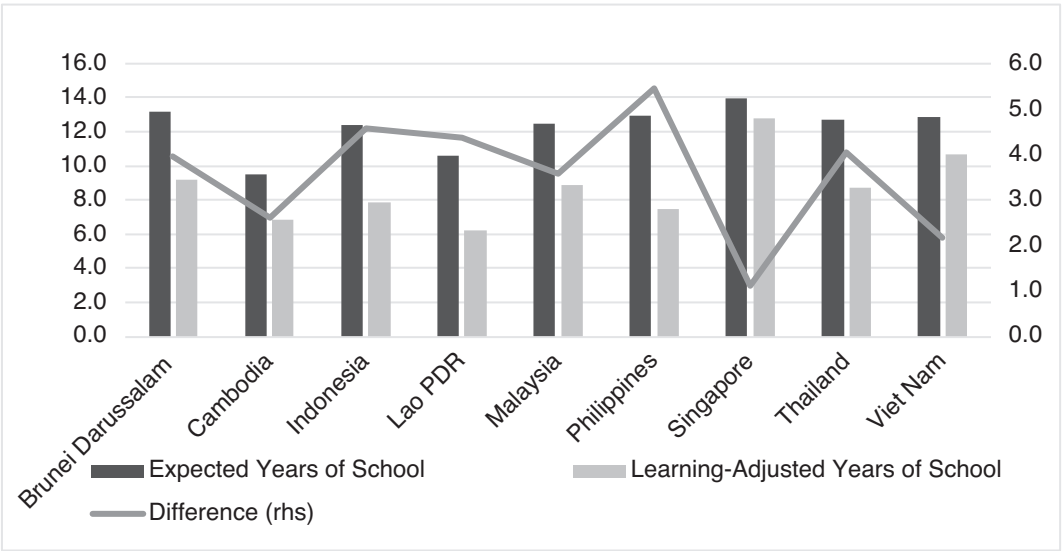
Similar differences can be observed in the Human Development Indicators—Education Index. The newer members of ASEAN, namely the Lao PDR, Cambodia, and Vietnam, lag Singapore and Malaysia. This is also reflected in the percentage increase in index required to attain the Singapore level being higher for the lagging countries.

FIGURE 4
PISA Score 2018



SOURCE: PISA Results 2018, OECD.

FIGURE 5
Average and Learning-Adjusted Years of Schooling, 2020



SOURCE: World Bank. Human Capital Index, 2020.

TABLE 2
Education Index for the ASEAN Member Countries (2019)

Rank Out of 189 (2019)	*HDI (Value)*	*Education Index*	*% Increase Needed to Attain Singapore's Level*
	2019	*2019*	
Brunei Darussalam (47)	0.838	0.702	16.82%
Cambodia (144)	0.594	0.484	42.65%
Indonesia (107)	0.718	0.65	22.99%
Lao PDR (137)	0.613	0.481	43.01%
Malaysia (62)	0.810	0.726	13.98%
Philippines (107)	0.718	0.678	19.67%
Singapore (11)	0.938	0.844	0%
Thailand (79)	0.772	0.682	19.19%
Vietnam (117)	0.704	0.63	25.36%

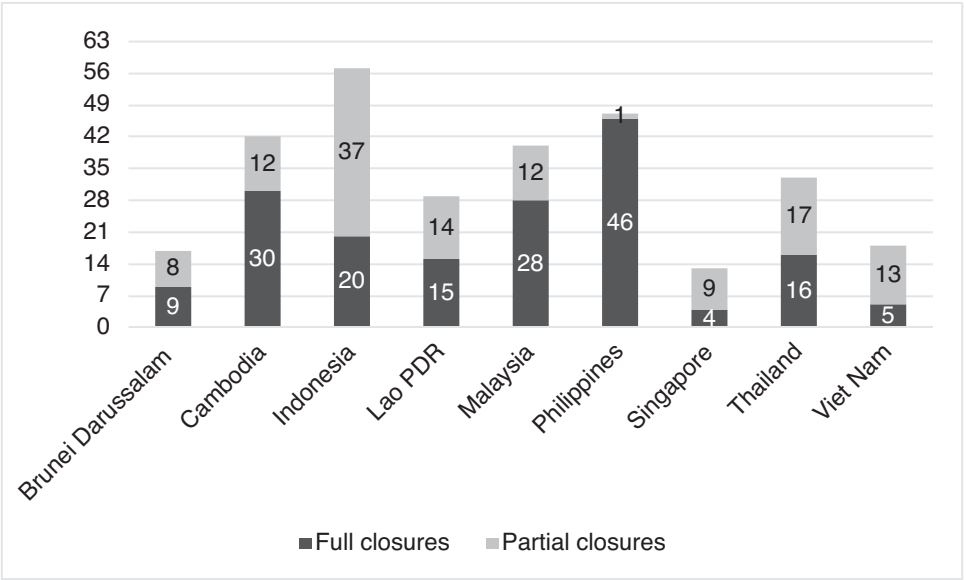
SOURCE: UNDP Human Development Indicators.

3.4 COVID-19 and the Education Divide

While the differences in education indicators existed before the COVID-19 pandemic, these were further aggravated in 2020 and beyond as the pandemic forced governments to make people adhere to lockdowns, isolation, social distancing and cessation of daily activities to limit the spread of the virus. Education was affected by these measures, as countries went into government-directed school closures. According to the Human Development Report (2020), school closure affected around 90 per cent of children globally. While some could afford to learn remotely through the Internet, others suffered a complete loss of formal education in 2020. It is estimated that, during the peak of COVID-19, while the short-term out-of-school rate in primary education was 20 per cent for countries with high human development, this indicator was 86 per cent in low human development countries. The shock to the education sector will result in a long-term loss in students' learning capabilities that will have implications throughout adult life, including the loss in earnings. The same learning shock was felt across ASEAN countries. Schools were closed either fully or partially (i.e., in some parts of the country and/or for selected grades). From March 2020 to June 2021, while government-directed school closure was the longest for the Philippines (forty-seven weeks), it was the shortest for Singapore (thirteen weeks), Brunei Darussalam (seventeen weeks), and Vietnam (eighteen weeks) (Figure 6). Singapore and Vietnam implemented partial school closures rather than full closures.

Remote learning became a way to mitigate some of the adverse effects of school closures. A survey done by UNESCO[4] in collaboration with UNICEF, the World Bank, and the OECD highlighted those ASEAN countries predominantly used online platforms (similar to Google Meet, Zoom, and other websites) and television as modes for education. The Lao PDR and the Philippines also used radio as a medium for instruction. Paper-based learning modules or worksheets were also distributed in most countries where students do not have access to television or the Internet. ADB (2021a) estimates show that school closures during the pandemic resulted in greater loss of LAYS in all scenarios (best, intermediate and worst) based on the assumption of the level of effectiveness of remote learning compared to physical learning in developing countries. While it is estimated that in 2020, Southeast Asia had an average of 8.34 LAYS, the school closures during the pandemic resulted in the greater loss of an estimated 35 per cent of LAYS in the intermediate scenario, 27 per cent in the best scenario, and 45 per cent in the worst scenario.

FIGURE 6
Number of Weeks Schools Partially or Fully Closed, till 30 June 2021



SOURCE: UNESCO COVID-19 Response.

These are higher than the average for developing countries in Asia, where the estimated loss of a LAYS is 23 per cent, 29 per cent and 38 per cent in the best, intermediate and worst-case scenarios, respectively.

Table 3 shows the variation in learning losses among ASEAN countries for all three scenarios. In the intermediate scenario, the highest losses are observed for Malaysia, the Philippines and Cambodia, which also faced relatively longer periods of full school closure during the pandemic. These differences also reflect the extent of these countries' readiness in terms of distance learning, as the decision to close schools for almost all these countries was quick, with little time for preparation among teachers or household members (ADB 2021a).

Access to online learning also depends on households' access to ICT infrastructure and tools. ASEAN countries differ considerably in terms of the proportion of households with access to the Internet, computers and mobile devices (Figure 7). This has great importance for efficient remote learning during school closures. While 90 per cent or more of households in Singapore and Malaysia have access to the Internet, this falls to below 50 per cent for Cambodia, the Lao PDR, the Philippines and Vietnam. The gap is stark, as in the case of households owning a computer. Ownership of mobile phones is relatively better, as more than 75 per cent of individuals in Brunei Darussalam, Malaysia, the Philippines, Singapore and Thailand own a handset.

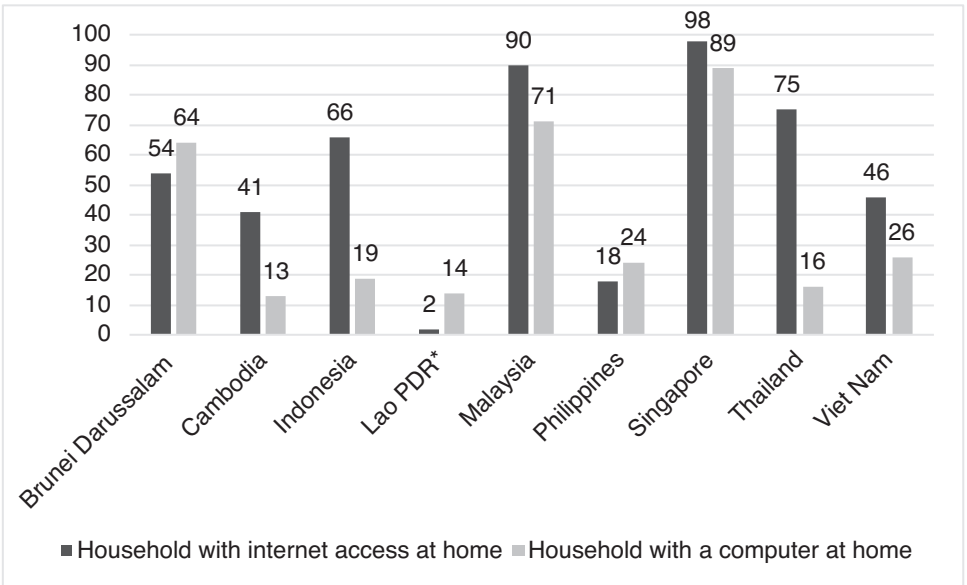
Kizilcec and Halawa (2015) have argued that attrition rates in online education are generally higher than in classroom learning. They found that online learners from developing countries tend to have lower test scores than learners from advanced countries. The COVID-19 pandemic must have led to higher attrition rates among students in less developed countries compared to more advanced ones. This will not only translate into the loss of labour productivity and economic competitiveness among ASEAN member countries but also into a loss in earnings over time.

TABLE 3
Learning Losses

	Average Loss in LAYS			*Baseline*
	Optimistic	*Intermediate*	*Pessimistic*	*LAYS 2020*
Brunei Darussalam	0.05	0.15	0.27	9.22
Cambodia	0.37	0.42	0.50	6.84
Indonesia	0.22	0.33	0.48	7.83
Lao PDR	0.18	0.21	0.25	6.25
Malaysia	0.45	0.67	0.95	8.89
Philippines	0.53	0.61	0.72	7.49
Singapore	0.04	0.10	0.18	12.81
Thailand	0.15	0.22	0.31	8.68
Vietnam	0.17	0.20	0.23	10.68
Southeast Asia	0.27	0.35	0.45	8.34

SOURCE: ADB (2021a).

FIGURE 7
Percentage of Households with Access to Digital Means, 2019



NOTE: Data for the Lao PDR pertain to 2017.
SOURCE: International Telecommunication Union, Country ICT Data, Digital Development Dashboard.

4. Measuring the Potential Impact of the Education Divide in ASEAN

This section looks at education as a sector and its impact on other sectors of the economy; it is divided into two parts, which focus on the methodology and findings, respectively.

4.1 Methodology

This paper attempts to measure the potential effects of education quality in ASEAN countries on economic growth and development, increasing the possibility of achieving economic outcomes from greater regional integration. The section is based on a widely used global multi-country, multi-sector Computable General Equilibrium model and dataset called GTAP (Global Trade Analysis Project). The important advantage of this dataset is its macro-sectoral level information on education and its forward and backward linkages with other sectors, as well as multiple countries. The analysis measures the quality of education using the 2019 Education index from the UN Human Development Report.[5] ICT is inherent in the quality of education index. The methodology deployed gives a one-time education productivity shock to laggard countries to reach the level of Singapore (based on the 2019 Education Index from the UN Human Development Report shown in Table 2). The analysis in this paper assumes there is a linear correlation between the quality of education and productivity. The simulations are comparatively static and do not consider the dynamic nature of the trickle-down impact of educational quality on labour productivity over time.

4.2 GTAP Model and Database

The global research community has widely used Computable General Equilibrium (CGE) models to answer pressing policy questions. The CGE model is a framework in which the linkages between various sectors and the allocation of endowments/resources (such as land, labour and capital) are captured. This framework accounts for the fact that resources are fixed in the economy while sectors can expand and contract, depending on how much their product is needed by other sectors and by final consumers. For each sector, a typical CGE dataset comprises the inputs needed for production in terms of factors and materials used from the production of other sectors, imports and details of where the output goes: domestic or exports. What happens in one sector can affect the whole economy, not only through its share in the economy, but also through its forward and backward linkages with other sectors. In other words, education may be a small sector vis-à-vis the size of the economy, but if we account for its linkages with other economic sectors, it can be very significant. GTAP data has 2014 as a reference year, so our first step was to update it to 2019 using macroeconomic data available from the World Bank on GDP, consumption, investment, government, exports and imports, and using the GTAPAdjust entropy optimization procedure.

4.3 Findings

Table 4 shows the positive contribution of education quality (improved human resources) to output growth and international trade (exports and imports). Countries may lose or gain in terms of exports or imports depending on the extent of the expansion of domestic production and consumption. For example, if there is excessive domestic demand, exports may fall, and imports may rise; therefore, neither of these is a symptom of adverse development as GDP and economic welfare increase in all cases. All ASEAN countries have seen an increase in GDP due to the quality upgrade, with the highest being the Lao PDR and the lowest being Malaysia. Most ASEAN countries have seen an increase in the volume of merchandise exports except for Brunei Darussalam, Indonesia, the Lao PDR and the Philippines. Indonesia has the most significant drop by 2.75 per cent. This comes from excessive domestic demand for goods and services required to expand the education sector in these countries. All countries saw an increase in the volume of merchandise imports by region, except Cambodia, with a decrease of 0.11 per cent, due to greater domestic production capacity created in some goods and services that depend on the education sector.

TABLE 4
Percentage and Absolute Changes due to Rise in Education Quality

	GDP Output		*Merchandise Exports*		*Merchandise Imports*	
	% Gain	*Absolute**	*% Gain/Loss*	*Absolute**	*% Gain/Loss*	*Absolute**
Brunei Darussalam	0.62	75.6	–0.02	–2.18	0.11	4.75
Cambodia	0.85	188.9	0.04	8.70	–0.11	–24.85
Indonesia	0.88	8,932.7	–2.75	–6,066.33	2.10	4,074.38
Lao PDR	1.22	205.5	–0.27	–13.03	0.33	26.27
Malaysia	0.46	1,453.3	0.05	122.19	0.04	82.28
Philippines	0.80	2,510.7	–0.19	–168.18	0.16	208.11
Singapore	<0.00	negligible	0.02	85.78	0.04	141.38
Thailand	0.67	3,064.4	0.00	13.94	0.08	199.66
Vietnam	0.78	1,747.5	0.08	191.61	0.12	293.23

NOTE: * in US$ million in 2019 prices.
SOURCE: Authors' model simulations.

TABLE 5
Education Sector Output and Economic Welfare

	Education Sector: % Gain in Output	*Private Consumption: % Gain*	*Economic Welfare US$ million*
Brunei Darussalam	24.53	0.327	70.57
Cambodia	116.82	0.550	155.52
Indonesia	22.58	0.927	9,714.43
Lao PDR	72.51	0.615	211.95
Malaysia	15.70	0.300	1,379.73
Philippines	17.07	0.571	2,517.38
Singapore	—	0.007	18.12
Thailand	21.98	0.380	2,979.90
Vietnam	29.20	0.670	1,666.93

SOURCE: Authors' model simulations.

Most countries saw an increase in the output of the "education" sector (Table 5), except for Singapore, with a marginal 0.22 per cent decrease. The highest is Cambodia, followed by the Lao PDR and Vietnam. The reason why this increase appeared in all countries except Singapore is that Singapore's education sector was the target towards which the model increased the productivity of other countries. The city-state thus has no relative gain in productivity compared to these other countries and faces a marginal decline in the education sector. In other words, Singapore's education sector is hardly affected, given that its productivity remains unchanged. Most ASEAN countries show a positive change in economic welfare (measured as an equivalent variation), with Indonesia showing the greatest change, along with the percentage change in private consumption. As shown in Table 4, it makes sense why some of the countries face a fall in exports, due to the rise in private consumption demand, mainly because of the demand for

goods and services corresponding to the uplift of the education sector, leading to greater wages for people at large, who in turn consume more.

As this is a static simulation exercise, the results should be interpreted as the impact of improved quality and productivity of the education sector on economic growth, trade, the quantity of education supplied and economic welfare, which in turn have ripple effects on the sectors with forward and backward linkages. In all countries, utility and construction, transport and communication increase because of their strong complementarities with the education sector. In all countries except Brunei Darussalam, the agricultural and food sectors and other services sectors also gain. There are mixed results in other sectors across countries. When a sector declines, it means that there is competition for factor endowments between the losing sectors and the education sector, resulting in a movement of factors from these sectors into the education sector. Such diversions are particularly observed in sectors like textiles and heavy manufacturing. Table 6 presents the impact on other sectors of the individual economies.

A key element in bridging the gap between high- and low-performing countries in international assessments like PISA are digital technologies. Digital platforms, especially for education, can help mitigate the inefficiencies of weak institutions and poor infrastructure, especially in developing countries. It might sound counterintuitive that governments which cannot maintain school buildings in rural areas should focus on a likely more expensive option (digital technology in education). However, the increasing penetration rates of smartphones and other digital platforms through which students can gain access to an inclusive education system have promise. According to the ADB (2021b) Asian Economic Integration Report, countries have partnered with telecommunications companies to increase bandwidth to try and reach people from disadvantaged communities with limited access to digital platforms. This digital expansion will also aid in improving productivity (through education or otherwise), which will further lead to growth in output as evinced by the positive changes in GDP throughout the ASEAN economies and other indicators.

5. Regional Cooperation in Education

This section looks at the cautious approach that ASEAN and the European Union have taken towards education cooperation. While the EU is in a relatively advanced stage of education cooperation, it has taken around fifty years to reach that stage. ASEAN education cooperation has a long way to go.

5.1 ASEAN Education Cooperation

The ASEAN Charter (ASEAN Secretariat 2007) stresses the importance of human resources "through closer cooperation in education".[6] This was further elaborated in the Cha-Am Hua Hin Declaration on Strengthening Cooperation on Education to achieve an ASEAN Caring and Sharing Community (2009)[7] that linked enhanced education quality to improved mobility of workers to raise the competitiveness of the ASEAN region in the long run. Even long before the Charter, the countries had established the Southeast Asian Ministers of Education Organization (SEAMEO) in 1965 to help countries with their nation-building objectives and agendas, such as basic education for all, teacher training, and vocational training, among others.

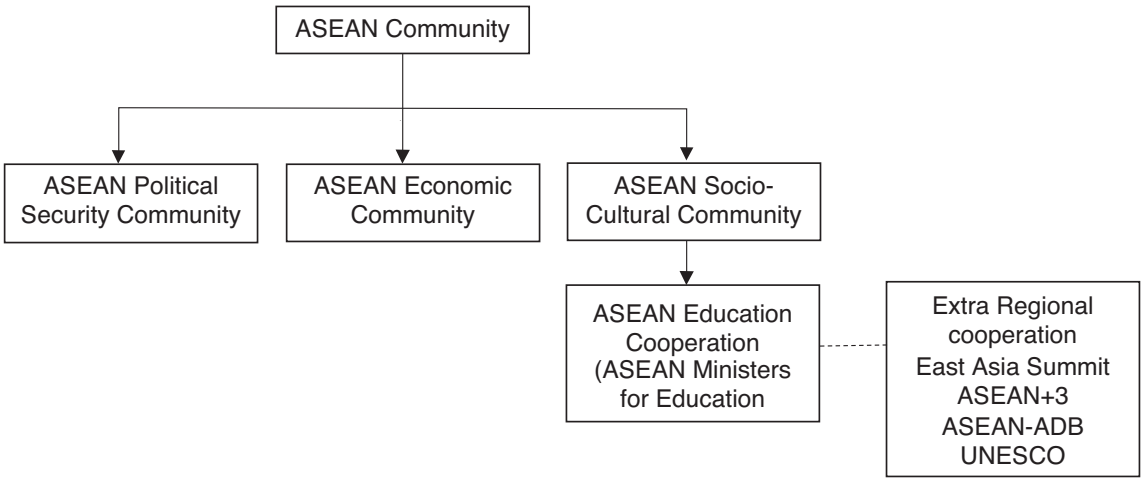
The region has established new institutions, including the ASEAN Education Ministers' Meeting (ASED) in 2006, which was responsible for facilitating the building of the ASEAN Economic Community. Both new and old institutions have worked in tandem since then to harmonize ASEAN education—or, more particularly, the higher education system—to lead ASEAN towards a knowledge-based society in the long term (ASEAN 2015). Cooperation in education (human development) resides under the ASEAN Socio-Cultural pillar (Figure 8). ASEAN's goal is to achieve better livelihoods for its populations

TABLE 6
Percent Changes to Output in Other Sectors

Sector	*Brunei Darussalam*	*Cambodia*	*Indonesia*	*Lao PDR*	*Malaysia*	*Philippines*	*Singapore*	*Thailand*	*Vietnam*
Grain Crops	–0.05	**0.02**	–0.14	**0.03**	**0.05**	**0.09**	**0.01**	**0.02**	**0.02**
Meat	–0.12	**0.06**	**0.24**	**0.03**	**0.04**	**0.28**	**0.08**	**0.05**	**0.34**
Extraction	–0.10	**0.07**	–0.63	–0.41	–0.01	**0.00**	**0.00**	–0.03	–0.01
Processed Food	–0.04	**0.16**	–0.48	**0.15**	**0.08**	**0.16**	**0.21**	**0.10**	**0.21**
Textiles	–0.49	–1.48	–1.93	–3.50	–0.14	–0.10	–0.07	–0.23	0.05
Light manufacturing	–0.22	–0.35	**0.23**	–1.46	**0.08**	0.03	**0.12**	**0.05**	–0.02
Heavy manufacturing	–0.17	–0.39	–0.96	–2.25	–0.07	–0.28	**0.08**	–0.15	–0.11
Utility & Construction	**0.53**	**0.64**	**2.75**	**0.11**	**0.15**	**0.36**	**0.01**	**0.24**	**0.43**
Transport and communication	**0.16**	**0.22**	**0.59**	**0.27**	**0.10**	**0.21**	**0.02**	**0.06**	**0.35**
Other Services	–0.03	**0.74**	**0.57**	**0.48**	**0.11**	**0.31**	**0.02**	**0.07**	**0.32**

SOURCE: Authors' model simulations.

FIGURE 8
Placing ASEAN Education Cooperation in the ASEAN Community Pillar



SOURCE: Authors' illustration.

through investment in education and capacity-building, encouraging innovation and entrepreneurship, and integrating ICT to facilitate socio-economic development (ASEAN Secretariat 2009).

ASEAN has developed a five-year work plan to promote education for all. It is in its third phase, having completed 2010–15 and 2016–20. The ASEAN Work Plan on Education (2016–20), to achieve improved quality and access to basic education, aligns well with the UN Sustainable Development Goal 4 (SDG4), which calls for inclusive and equitable quality education for all.[8] ASEAN priority areas for basic education include enhancing education quality and access for all through quality-focused interventions. The latter includes online education's role in improving teaching quality and pays greater attention to higher and technical education. The latest workplan from 2021–25 was adopted by ASEAN countries earlier in 2021.

The use of ICT and raising the capacity to access digital learning have also been prioritized among the education systems. Currently, ICT initiatives in ASEAN are supported by the SEAMEO Regional Center for Innovation and Technology (INNOTECH) and the International Council for Open and Distance Education (ICDE). The activities range from massive open online courses (MOOCs) enabling students to study courses online, to open educational resources (OER) that provide online teaching materials in the form of filmed lectures, tapes and videos.

Most ASEAN countries have improved their education indicators. The net enrolment rates for primary schools have been higher in recent years, implying that more children have access to education. Student-teacher ratios across many ASEAN members have improved, suggesting that teachers are well spread across a smaller number of students, thus giving them more attention. However, much needs to be done to improve school infrastructure and educational outcomes. While many education policies are the responsibility of national governments, cooperative measures can provide policy directions in a larger context of regional targets and aspirations. While ICT in education is available at the regional level for higher studies, it needs more rigorous implementation in primary and lower secondary education. ASEAN, as an organization, needs to promote ICT infrastructure and facilitate better accessibility, to adapt to the new normal of the post-COVID-19 era.

Basic education has yet to be rigorously discussed in ASEAN documents, although it has a significant role in higher education. Education is currently tied up to the AEC characteristics of "mobility of skilled labour", which is limited, and education has much larger implications as the ten members of ASEAN have competitive advantages in different industries or different value chains within a particular industry. Raising education quality in the national economies will enable them to increase their economic competitiveness and attract foreign investment. Aggregating the individual economies will ultimately enable ASEAN to achieve its aspiration of a single market and production base in the long run. ASEAN is, however, unlikely to move towards a common approach in pursuing basic education under the ASEAN socio-cultural pillar. There are too many differences among the ASEAN countries to pursue basic education in a harmonized manner.

5.2 Evolution of EU Education Cooperation

Earlier in 2021, the EU members adopted a framework for European education cooperation 2021–30 in accordance with the goals of creating a European Education Area by 2025. It emphasized five priority areas, including: improving the quality and inclusivity of the education system for all, achieving lifelong learning, motivating teachers in the education profession, strengthening higher education, and supporting green and digital transformation through education. Reaching the decision to establish an education area took more than five decades. The first meeting for education cooperation among the respective ministries took place in November 1971, which later passed a resolution in 1976 that was non-binding. It primarily showed the political will to participate in education cooperation. In the early 1980s, education cooperation was incorporated for discussion in relation to the EU's economic and social objectives. While 1992 saw education (including school education) as part of the Maastricht Treaty, the treaty remained quiet on harmonization topics. The European Parliament became a stakeholder in education cooperation, giving it a more legal identity. Starting in 1993, as the EU implemented its single market, education cooperation entered a new phase. The evolution of education cooperation in the EU was largely driven by globalization, with an increased discussion of a knowledge-based society, information society, and lifelong learning (European Commission 2006).

In the late-1990s, several countries in the EU showed their willingness for harmonization in higher education. After much deliberation, thirty European countries agreed to join the Bologna process in 1998 to achieve some form of convergence across the different higher education systems. As EU cooperation entered a new phase of economic, social and environmental goals in 2000 with the Lisbon strategy, education cooperation became a core element to success. A single integrated framework for policy cooperation in education came into being in 2004. The EU has developed many programmes since the 1980s, including Comett, Erasmus, PETRA, Youth for Europe, Lingua and Eurotecnet.[9] The grouping launched frameworks in Education and Training in 2010 and 2020 that provided opportunities to build on best practices in education policy and advance policy reforms at the national and regional levels. Different target measures were set to cover both the quantity and quality of education, in line with lifelong learning objectives.[10]

In summary, one may say that it took a while for the EU to garner confidence in education cooperation. Starting from 1971, it took more than twenty-five years to reach the stage of harmonization; prior to that, there was political willingness, although commitments were kept broad and flexible. It was only in 2000 that the EU strengthened the connections between education cooperation and economic and social cohesion. Compared to the EU, ASEAN is a much younger organization. It has been just around twenty years since ASEAN started discussing the parameters of the ASEAN Community. While the EU's education cooperation was driven by both internal and external pressures, such as economic downturn, unemployment, globalization and a wish to adopt concepts like lifelong learning and the knowledge

economy, it is possible that, for ASEAN, the impact of COVID-19 long after the pandemic years will be a turning point in education cooperation.

6. Conclusion and Policy Recommendations

This paper discussed the education divide among ASEAN countries. The divide is largely observed in quality and output rather than in quantity. Looking at the 2019 Education Index from the UN Human Development Report, Singapore ranks the highest among ASEAN members, while others lag by differing extents. The COVID-19 pandemic has exacerbated this divide. With school closures and mass online education, countries seem to have suffered learning losses that are generally higher than elsewhere in Asia. These losses undermine the objective of building the ASEAN Economic Community. Better quality education is a necessary condition for increased capability in the acquisition of skills and hence human resource development. It is directly correlated with building economic competitiveness, which ASEAN countries aim to achieve through economic integration within themselves and the global community.

The simulation exercise, which looked at a hypothetical scenario in which all of the ASEAN member countries put in the effort and investment needed to raise the HDI—Education Index to the extent of Singapore, concluded that the productivity improvements in the education sector may have a profound short-term economic impact due to the ripple effect coming from greater consumption of goods and services related to the education sector, even when long-term labour productivity gains from improved education are not taken into account. The countries that currently have much lower educational quality, attainment, and productivity are the ones that may particularly have the most to gain. GDP and economic welfare would rise for all ASEAN countries except Singapore, which would remain unchanged due to the assumption that its education sector would not witness any further improvement from its already high levels. The rise and fall of exports and imports were determined by greater economic activity-induced demand and greater expansion of domestic production and consumption patterns.

The results emphasize that improved education quality increases the potential of ASEAN countries to achieve a better economic outcome in national economies that advances regional economic cooperation. This, in turn, incentivizes ASEAN countries to strengthen commitments under education cooperation and link it better with ASEAN Economic Community measures.

Going forward, the paper provides the following policy recommendations:

- Although education is the responsibility of national governments, the overarching ambition of forming an ASEAN Community should compel policymakers to set targets at the regional level to improve education quality and outputs. Measures in education cooperation should be aligned with all components of the AEC. Currently, education is tied to the AEC characteristics of "mobility of skilled labour", which is limited in nature. Education cooperation should also be discussed in the Master Plan of ASEAN Connectivity that covers ICT and broadband infrastructure, which became a key for online education during the COVID-19 pandemic.
- Further policy papers should be written on lifelong learning or knowledge-based manufacturing, which are already mentioned in the AEC Blueprint. Corresponding targets should be set for national economies to succeed in these emerging concepts.
- Regional cooperation could explore ways to establish quality assurance systems for all levels of education, including through the ASEAN Quality Assurance Network (AQAN) and the ASEAN Quality Assurance Framework (AQAF).
- Basic education has yet to be rigorously discussed in ASEAN documents. More discussion is needed on quality convergence among the countries.
- ASEAN should promote exchange programmes among students at all levels. In the post-pandemic

period, a blended approach of online and physical exchanges could be explored to encourage balanced mobility.
- While the movement of teaching professionals may not be desirable at this juncture, networking events and exchange programmes should be encouraged among ASEAN countries for knowledge sharing and peer-to-peer learning.
- The use of ICT is possible at the regional level for higher studies but needs to be incorporated for basic education as well. Regional cooperation should strive to improve the availability and accessibility of broadband networks and IT tools for students, teachers, and households. The use of Big Data should be encouraged for efficient policymaking in the post-COVID-19 era. The private sector should be engaged to work with telecom companies to gather and analyse data at the household level to understand regional needs going forward.

Acknowledgements

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NOTES

1. The ASEAN Economic Community is one of the three pillars of the ASEAN Community. The other two pillars are the ASEAN Political-Security Community and ASEAN Socio-Cultural Community.
2. Basic education comprises primary education and lower secondary education (first and second stages of education) (http://uis.unesco.org/en/glossary-term/basic-education).
3. This is derived from a relatively new indicator called Learning Average Years of Schooling (LAYS), which captures both quantity and quality of education. For a student, this is measured as the number of years of schooling by age eighteen, adjusted by the country's average student achievement. In general, for developing Asia, a LAYS that captures quality of education is lower than the quantity, i.e., average years of schooling, in a country (ADB 2021a).
4. UNESCO, Survey on National Education Responses to COVID-19 School Closures (tcg.uis.unesco.org/survey-education-covid-school-closures/).
5. This paper considered the UN-Human Development Report—Education Index and not the World Bank's Human Capital Index (HCI), as the latter combines both health and education for its index score.
6. ASEAN Charter (2007) (p. 4).
7. https://asean.org/wp-content/uploads/images/archive/15thsummit/Declaration-Education.pdf
8. https://bangkok.unesco.org/sites/default/files/assets/article/Education/files/session-2asean-cooperation-education-sdg-4.pdf
9. Comett is a programme for education in training and technology; ERASMUS is a student exchange programme in the EU; the PETRA Programme focuses on vocational training for young people and preparing them for their adult lives; Youth for Europe is a portal providing opportunities within the region; Lingua promotes foreign language competence; and Eurotecnet deals with self-learning competency, training the trainers, and others.
10. For example, 15 per cent of fifteen-year-olds should be underskilled in Reading, Mathematics and Science or at least 15 per cent of adults should participate in learning.

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Mobile-Assisted Language Teaching
A Systematic Review with Implications for Southeast Asia

Sira Maliphol

COVID-19 created a sudden move to online learning modes in Southeast Asia and the rest of the world, highlighting the need for updated teacher training to adopt computer- and mobile-assisted learning/teaching techniques. The changes in technology provide a multimedia platform that revolutionizes how people can interact through ICT, including for education. The results of mobile-assisted language learning (MALL) on student performance have not been overwhelmingly positive. Yet, the use of technology-based instruction tools seems inevitable. The proliferation of ICT technologies, including the Internet, broadband, and mobile technologies, will continue to increase and offer advantages to tap into. How are teachers—educational service sector workers—affected by technological change? Education systems in Southeast Asia can benefit from mobile-assisted language teaching (MALT) in ways that address the specific obstacles that are faced by countries in the region. This systematic review considers the topics covered in the literature on MALT for content analysis. The implications will be considered for educational contexts in Southeast Asia. The different strategies that are employed with ICT and/or mobile technology differ from traditional classroom learning. The systematic review findings suggest that the existing research is constrained by the type of technologies studied, especially a bias towards existing technologies.

Keywords: Computer/mobile-assisted language teaching, education technology, Southeast Asia.

1. Introduction

The cultural and historical richness of Southeast Asian countries means that a large population is educated in many different languages. The education policy in Southeast Asian countries has the common feature that national languages are emphasized in curriculums. Yet, several countries allow for more than one official language of instruction. Except for Indonesia, English language instruction is also mandatory

Sira Maliphol is Assistant Professor in the Department ofTechnology and Society at the State University of New York, Korea, 119-2 Songdo Moonhwa-Ro, Yeonsu-Gu, Incheon, Korea 21985; email: sira.maliphol@sunykorea.ac.kr

as a second language starting in early primary school in the rest of the ASEAN region (Liddicoat and Kirkpatrick 2020). Universities in Southeast Asia are also focusing on improving their higher education through internationalization strategies (Salihu 2020), which suggests the need for a common language of instruction, i.e., English. The challenges presented in language education in Southeast Asia can be better addressed through new technologies of mobile-assisted language teaching (MALT).

COVID-19 strained education services leading to learning losses around the globe. Many traditional classrooms adapted to COVID-19 by moving to online modes of learning. In some education systems, the use of ICT- and mobile-assisted language learning (MALL) applications has ameliorated some of the losses. The application of computer and mobile technology will have long-lasting implications for teaching even after the pandemic has receded from crisis levels. Although these gains are limited to those districts and households that have the means to supply computers and mobile technology, the lessons will be applicable as more and more classrooms, and individuals adopt the technologies.

Mobile phones and tablets have proliferated since the introduction of smartphone technology just over a decade ago. The technology provides a multimedia platform that revolutionized how people can interact through ICT for learning. The results of MALL on student performance have not been overwhelmingly positive (García Botero et al. 2019) self-regulation and scaffolding are two under-researched concepts when it comes to mobile learning. To tackle this knowledge gap, this study focuses on self-regulation and scaffolding for MALL. Yet, the use of technology-based instruction tools seems inevitable. Technology is primarily adopted because it increases efficiency or offers new features or functions, which economists refer to as increased utility. While most studies have focused on learning aspects of MALL, this study aims to understand how teachers are affected by the introduction of technologies in the classroom.

Widely adopted in the analysis of mobile-assisted education, the TPACK Framework focuses on the intersection of Technology, Pedagogy, and Content Knowledge for understanding MALL/MALT (Yang and Kuo 2020). These three perspectives comprise the main areas related to mobile-assisted learning/teaching. Pedagogy, including content knowledge, involves the interaction between teachers and students with an understanding of what the role of each is. With the introduction of new technology, these roles change and must be adapted to changing environments. How are teachers—the workers in the educational service sector—affected by technological change? How are teachers trained to adapt to these new mobile-assisted environments?

Systematic review methods allow for the quantitative synthesis of multiple studies using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) using the Population, Intervention, Comparator, Outcomes, and Settings (PICOS) strategy (Barba-Martín et al. 2020; Moher et al. 2009; Selçuk 2019). By adopting the PRISMA framework, this literature survey uses a systematic review to: (i) understand what kind of research exists on mobile apps used in language education; (ii) understand how they have been integrated into the classroom through teacher training, and more importantly; and (iii) understand how MALT can be better integrated into teaching and learning interactions. The implications of the study will focus on how teacher professional development would need to incorporate the new computer and mobile applications into lessons for language learning, especially when public-private partnerships are involved in delivering related education services. The study focuses on content analysis of research related to MALT.

The findings of the systematic review found that the research is still constrained in the types of technologies, pedagogical aspects and content that are studied. The implications of these findings suggest how they would affect basic education quality in Southeast Asian countries. The region is undergoing rapid demographic and political change, including rapid rises in youth populations, increasing enrolment rates across different education levels, and a greater number of students studying abroad (Salihu 2020). Education policy in the region tends to focus on national languages but also emphasizes foreign language

education in a globalized environment, especially English and Chinese (Salihu 2020; Wright 2002; Yi 2021). While teaching methodologies that focus on memorization and rote learning are de-emphasized, the approach is still common across Southeast Asia (Hallinger 2010; Idrus, Ng, and Jee 2014). The pupil-to-teacher ratio, an estimate for class size, is low compared to the global average and even relative to the average of OECD members (OECD 2021). Lastly, the region's physical geography includes different land masses and topologies that can stress student access and available infrastructure. Although pedagogy emphasizes the learner experience, this study finds that there is still much to be gained by focusing on how MALT affects interactions from the teachers' perspective.

2. Systematic Review

Tranfield et al. (2003) first applied the systematic review approach to reviewing literature in the social sciences using three main stages: planning, executing, and reporting. The main contribution of the method was ensuring a comprehensive, evidence-based review that would be replicable. Although the systematic review emerged from the biomedical field, it has been expanded to provide a framework for systematically providing a rapid assessment and analysis of the literature that provides evidence-based implications (Cartaxo, Pinto, and Soares 2018; Mallett et al. 2012; Moher et al. 2011). In contrast to traditional literature reviews, systematic reviews require the use of a planned, standard format applying the scientific method. The difference provides higher quality and sophistication with a comprehensive view of the research. The method should specify how to identify, select, and validate the dataset of literature that is clear, recordable, and reproducible. Transparency of the process helps to minimize bias and errors that can arise when summarizing the evidence. Furthermore, there are several approaches to applying systematic reviews, including meta-ethnography, realist synthesis, thematic synthesis, framework synthesis, thematic summaries, and content analysis (Snilstveit, Oliver, and Vojtkova, 2012; Wong et al. 2015). This study adopts the content analysis because it is transparent, replicable, and the most frequently applied to categorize each theme and to count its frequency to identify key findings (Snilstveit, Oliver, and Vojtkova 2012).

2.1 Scoping and Identification of Studies

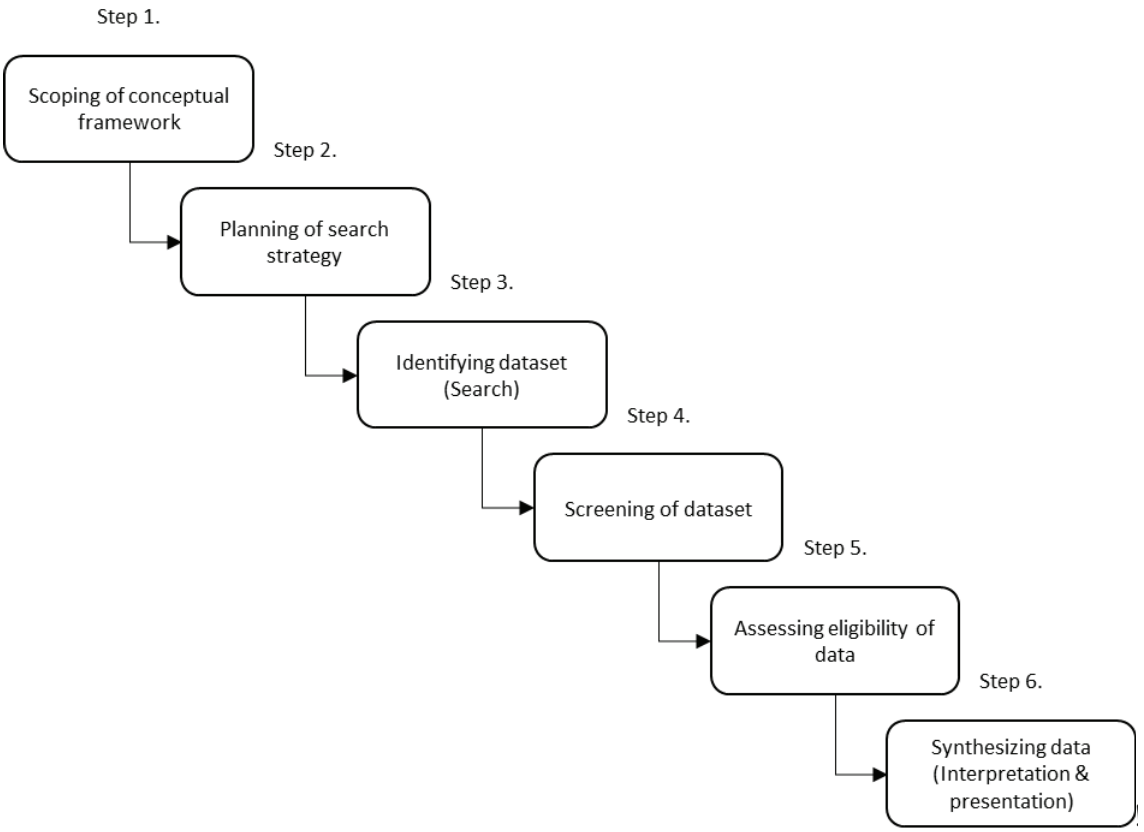
The systematic review method allows for the quantitative synthesis of multiple studies using the PRISMA framework, including the PICOS strategy (Barba-Martín et al. 2020; Moher et al. 2009; Selçuk 2019). PRISMA makes the process explicit by outlining twenty-seven steps that should be followed and delineating PICOS that are analysed in the review (Selçuk 2019).

The start of the review requires a plan (Figure 1, Step 1) on how to first collect the dataset of literature (Tranfield et al. 2003; Gill and Kharas 2015). According to the PICOS strategy, a set of keywords is chosen that return the relevant sources of research while ensuring that non-relevant literature is omitted from the dataset (Figure 1, Step 2). The next step is to identify the keywords used in the search criteria applied to the database query, i.e., Web of Science (Figure 1, Step 3). While the first half of the process is automated in the search, the latter half is performed manually to ensure that the resulting dataset meets the defined and refined criteria after reviewing the resulting dataset. However, the rules applied to the selection are similar in that they are meant to ensure that the dataset is appropriate in content and quality.

2.2 Selection of Studies

The selection of studies begins with defining the keywords to apply the PICOS strategy. The data analysis must predetermine how the research literature will be compared according to the PICOS framework

FIGURE 1
Systematic Review Framework



SOURCE: Author's creation.

(Table 1). Since the methodology comes from the biomedical field, the framework largely takes on a patient-treatment-outcome perspective.

Once the initial dataset is collected, the publications should be further narrowed down by a set of criteria (Figure 2). Systematic reviews focus on literature that is screened for quality of research, i.e., peer-reviewed research. Reviews often remove publications based on the quality of publications, e.g., non-peer-reviewed journals or conference papers (Barba-Martín et al. 2020; Mallett et al. 2012; Selçuk 2019). Publications are chosen from English-language journals for practical reasons. The dataset was further screened to ensure that the publications involved teacher training or preparation for adopting mobile- or computer-assisted technologies for the classroom. Some publications that were generally related to classroom instruction but not language instruction were maintained in the final dataset.

2.3 Interpretation and Presentation of Results

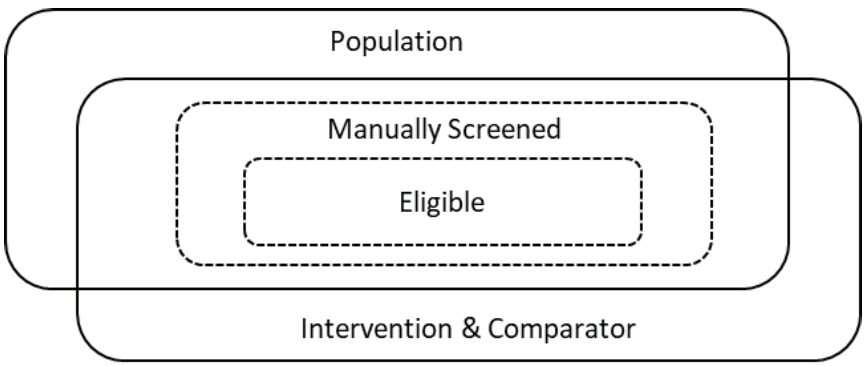
The third stage synthesizes the information in the resulting dataset. While several approaches can be adopted, this study uses content analysis because it is the most common (Snilstveit, Oliver, and Vojtkova

TABLE 1
PICOS Framework

	PICOS Strategy
Population	Population or subjects of the research reviewed
Intervention	Intervention or treatment applied to the subjects or population
Comparator	Comparator variable that is being compared across the studies reviewed
Outcomes	Outcomes or results of the studies being reviewed
Setting	Settings or environments in which the studies reviewed were carried out

SOURCE: Author's compilation.

FIGURE 2
Selection Criteria Diagram



SOURCE: Author's creation.

2012). The synthesis identifies the main themes and patterns in the dataset for the topics targeted by the study, i.e., teacher training for computer- and mobile-assisted technologies in the classroom. The themes are quantified to determine the common characteristics of the studies, especially according to the PICOS framework outlined. This approach also allows an analysis of themes that may be expected but missing from the research.

3. Results

3.1 Mobile-Assisted Language Teaching Scope

Although pedagogical theory emphasizes the learner perspective, this study focuses on educators. The education research literature refers to computer- and mobile-assisted learning, usually related to language learning, e.g., CALL or MALL. Based on the PICOS strategy (Table 2), the initial search criteria (SC_1) use the keywords to narrow down the eligibility of studies focusing on computer- and mobile-assisted language learning and teacher- and educator-related studies (Figure 3).

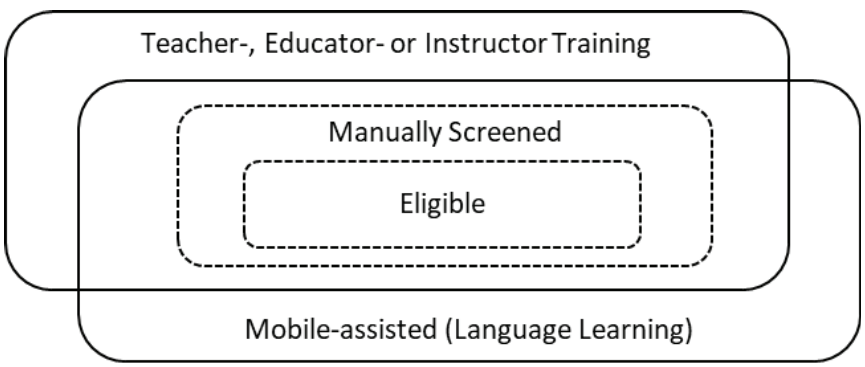
The selection criteria are defined to narrow down the scope of the literature first by automatically selecting the appropriate studies according to the keywords before manually screening the dataset further

TABLE 2
PICOS Strategy

	PICOS Strategy
Population	Educators or instructors or teachers
Intervention	Mobile-assisted or computer-assisted learning
Comparator	Training on technology or applications
Outcomes	Effects of teacher training or learning or teaching practice
Settings	Education levels & country case

SOURCE: Author's compilation.

FIGURE 3
Selection Criteria Diagram Applied



SOURCE: Author's creation.

(Figure 3). This process reduces the dataset to the studies that are eligible to be reviewed thoroughly according to the purpose of the systematic review.

The dataset of publications almost solely returned articles that mentioned language learning, which usually also mentioned learners and educators. So, the search criteria (SC_2) were refined. Since educators are almost always mentioned in research involving learning, the keywords chosen using the PICOS criteria were made more specific to the technology- and education-related activity, i.e., training on mobile-assisted teaching (Table 3). Language learning was removed from the search criteria because: (i) it made the criteria overly restrictive; (ii) most of the publications in the final dataset were still related to language learning; and (iii) the additional research tended to be general research on introducing the related technology to the classroom, which is incorporated into the final analysis.

3.2 Literature Selection and Eligibility

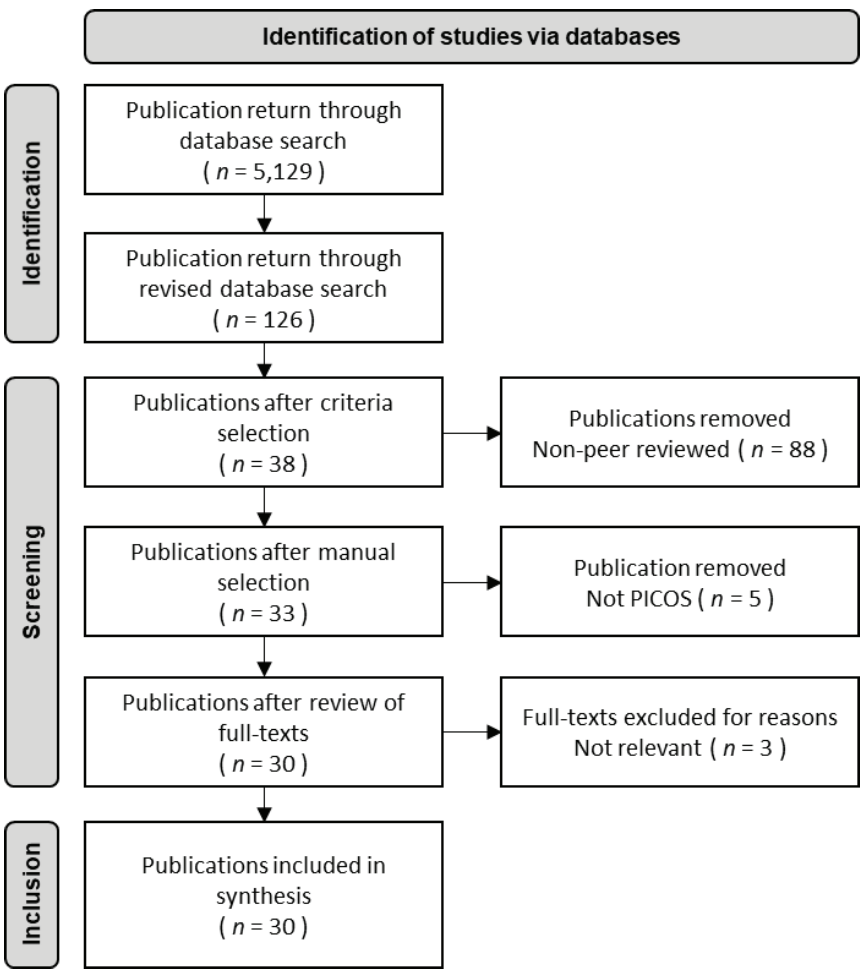
Once the keywords were identified for the selection of the studies based on the PICOS strategy, the literature for the review could be identified. The initial search returned 5,129 publications that were reduced to thirty publications through the systematic review (Figure 4). Six of the articles that were removed were written in Spanish. Since the large majority of articles are in English, the results are not

TABLE 3
Keywords used in the Database Search

	Search Criteria SC1	*Search Criteria SC2*
Technology Keyword	Computer-assisted OR Mobile-assisted	"Computer-assisted" OR "Mobile-assisted"
Topic	Language	n/a
Population	Teacher* OR Educator*	"Teacher training OR "Educator training" OR "Instructor training"
Context (intervention)	Teacher education	

SOURCE: Author's compilation.

FIGURE 4
Systematic Review Selection PRISMA Flowchart



SOURCE: Author's creation.

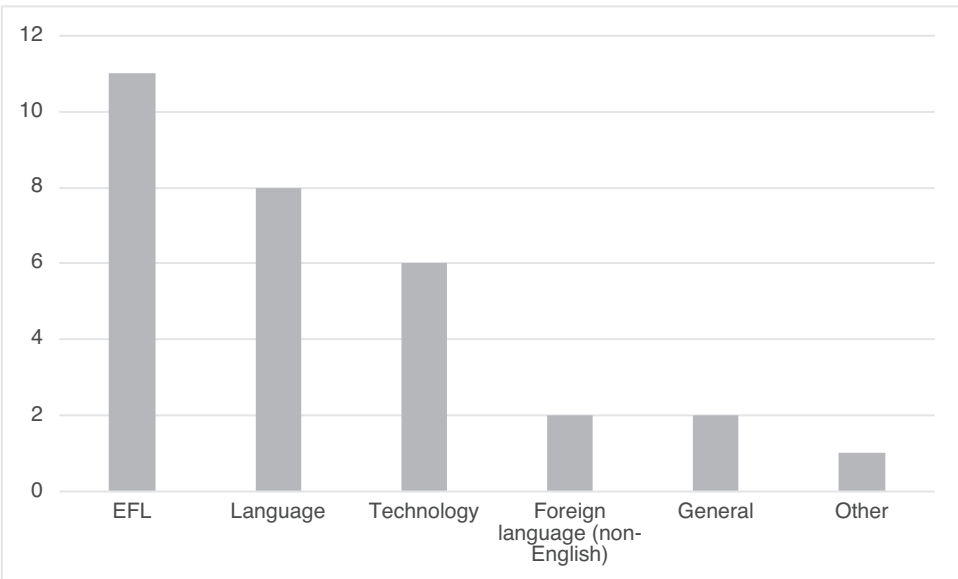
largely affected. Once the dataset was identified using the PICOS strategy, the rest of the publications were screened. Following previous studies (Barba-Martín et al. 2020; Mallett et al. 2012; Selçuk 2019), this study eliminated non-journal publications that are not peer-reviewed (eighty-eight). Most of these were conference papers that focused on survey data of student perspectives, which are not expected to impact the outcome of mobile applications in language teaching. The five publications that were removed manually involved higher education subjects such as medicine or physical education (three), did not involve the target technology (one), or were a book rather than a journal article (one). Other publications were removed from the final dataset after review of the complete texts because they focused on irrelevant technology (one), textbooks (one), or the learner only (one).

3.3 Content Analysis

The final dataset of publications included in the synthesis is presented in Appendix A: List of Studies. The final dataset is reduced to thirty English-language journal publications. The main themes that are identified theoretical frameworks that have been applied to MALT in the classroom, language education—especially foreign language education—instruction, and general applications of mobile-assisted technologies to teaching. Other patterns are identified, including concepts, characteristics, benefits, impacts, beneficiaries, and gaps in the research.

The most common topic or comparator covered in the systematic review is English as a Foreign Language (EFL). A framework for understanding educational technology includes Technology, Pedagogy, and Content Knowledge (TPACK) (Snilstveit, Oliver, and Vojtkova 2012; Wong et al. 2015). Therefore, the contents are analysed for these topic foci (Figure 5). Language learning is the most popular focus of mobile-assisted learning research, especially English as a foreign language. When specified, these studies also tend to focus on how to apply existing technologies such as MS PowerPoint.

FIGURE 5
Count of TPACK Topics



SOURCE: Author's analysis.

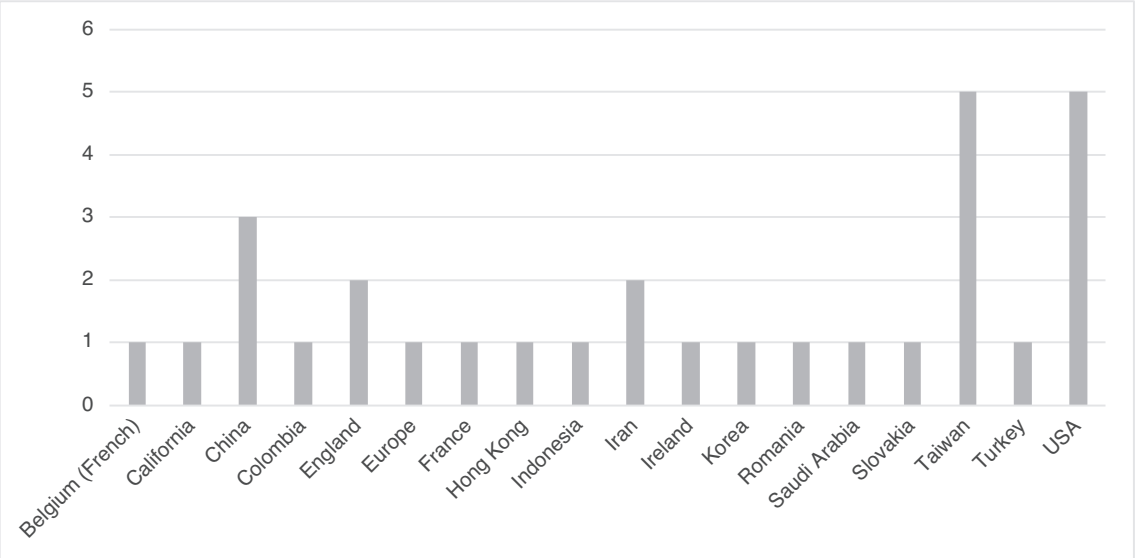
An evaluation of the content settings of the studies is considered from the country and education levels of the studies. The studies in the dataset represent the geographical settings of many countries around the world, including countries from four continents (Figure 6). China, Taiwan, and the US are the top three countries that are represented. Of the eighteen regions covered, seven countries are in Asia and only one study on Indonesia in Southeast Asia.

A distribution based on the level of education the studies focused on is presented (Figure 7). The majority of the studies focus on technology in the classroom generally or do not specify what level of education in the cases that were studied (twenty). Of the studies that focused on a specific education level, tertiary is the most common. Studies that focused on technology, e.g., platforms or analysis, were generally not associated with a particular level of education.

The studies are broken down by the method of research that is applied (Figure 8). Of the quantitative studies, only four had more than 100 observations. Often these quantitative studies were still focused on single classes. The majority of the methods employed were qualitative. Yet, these studies also focused on narrow aspects of the technologies being applied.

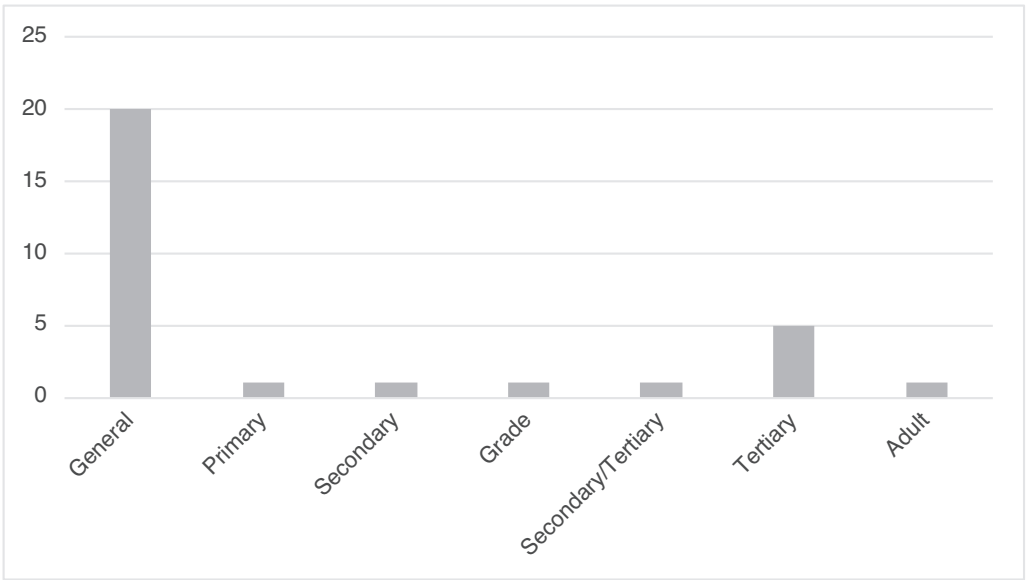
Although the publications in the dataset go back as far as 1970, most of them are from 2009 onward, after Apple introduced the iPhone in 2007 (Figure 9). With over two-thirds of the publications, the most common subject covered is language education, especially English as a foreign language which makes up half of these. Language learning was the direct focus of twenty-two of the publications in the final dataset. Half of these focused on English as a foreign language. Even when publications did not focus on language, they would often be related to communications in the subject field, e.g., how to use mobile technology for communications in the medical field. While the research spans many countries around the world, including China, Indonesia, South Korea, and Taiwan in East Asia, a third of the research is focused on the US.

FIGURE 6
Count of Country Cases



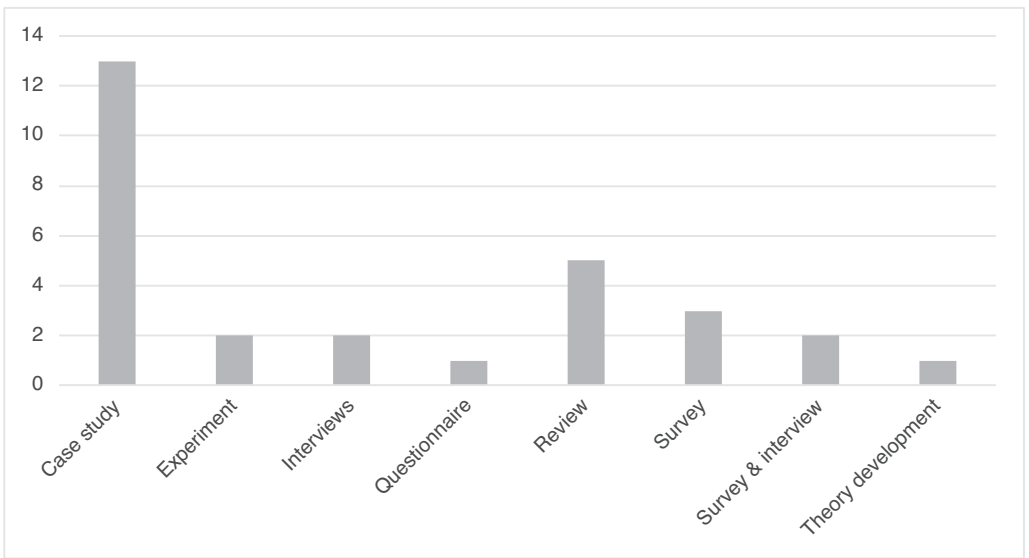
SOURCE: Author's analysis.

FIGURE 7
Count by Level of Education Focused on



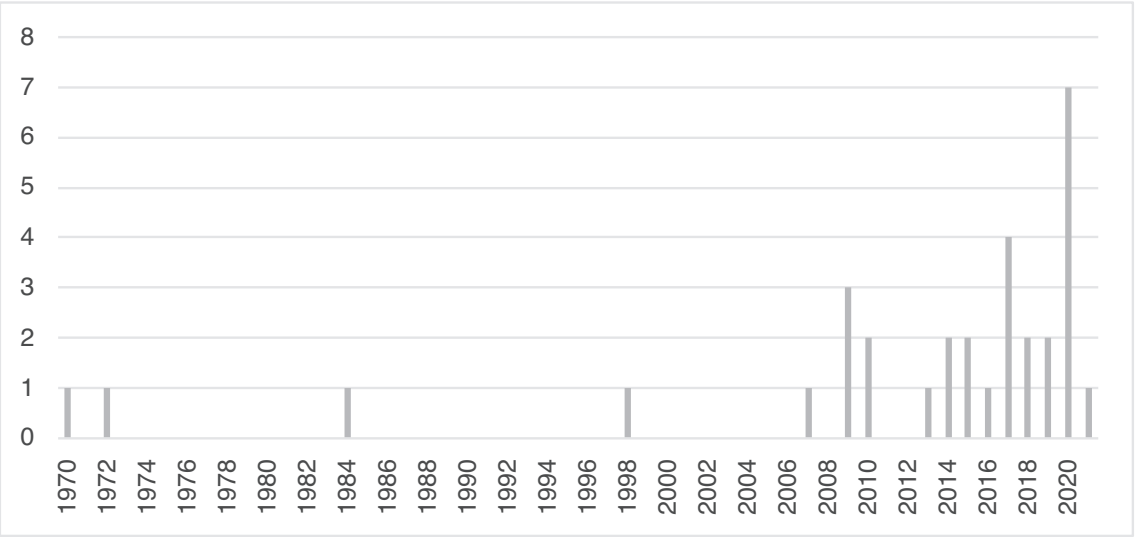
SOURCE: Author's analysis.

FIGURE 8
Count of Methodologies Employed



SOURCE: Author's analysis.

FIGURE 9
Frequency of Publications by Year



SOURCE: Author's analysis.

The journals that include publications in the final dataset are listed in Table 4. The frequency that the publications appear in an individual journal is no more than three. Most of the journals that are included in this list focus on educational technology (thirteen), general education or language instruction (five), or foreign language or multicultural education (four). Several journals have emerged focusing on the intersection of technology and learning, e.g., *Education and Information Technologies* and *Electronic Journal of E-Learning*. A few other journals that focus solely on technology rather than on education have crept into the list with individual articles appearing in them, i.e., *Quality & Quantity* and *System*.

4. Discussion on MALT Integration

The results of the systematic review identify how research has typically approached MALT. Most studies focus on language learning despite the scoping of the data identification removing it as one of the constraining conditions. Among these, there is also a heavy emphasis on EFL. The implication is that the types of language education that are reinforced through technology are basic language acquisition rather than complex language learning, e.g., literary analysis. The systematic review also suggests that the technology that has been the focus of this research is older, existing technological solutions that are applied to reinforce existing modes of teaching. Thus, there seems to be a great deal of room for research into areas that incorporate new technologies such as AI or Big Data, for which only one study in the dataset was the technological focus.

The pedagogical aspects tend to focus on the learner's perspective. For example, early research also suggests that technology can be adapted to different development stages (Jerman 1970). Considering the TPACK model, these studies tend to adopt existing technological applications and focus on practical aspects of pedagogy. The pedagogy involves the intersection of teacher-student interaction. One study focuses on the delivery of lessons through project-based learning (Tseng and Yeh 2019). Another study

TABLE 4
List of Journal Frequency among Eligible Publications

Journal Title	*Frequency*
British Journal of Educational Technology	3
Computer-Assisted Language Learning	3
Foreign Language Annals	2
Educational Technology & Society	2
Modern Language Journal	2
Arab World English Journal	2
Education And Information Technologies	2
Journal of the American Society for Information Science	1
International Review of Education	1
International Journal of Computer-Assisted Language Learning and Teaching	1
Asia Pacific Journal of Education	1
Journal of Multilingual and Multicultural Development	1
Teaching and Teacher Education	1
Hacettepe University Journal of Education	1
Australasian Journal of Educational Technology	1
Innoeduca-International Journal of Technology and Educational Innovation	1
Language Learning & Technology	1
Mier-Journal of Educational Studies Trends and Practices	1
Quality & Quantity	1
System	1
Computers & Education	1
Electronic Journal of E-Learning	1
Alsic-Apprentissage Des Langues Et Systems D Information Et De Communication	1

SOURCE: Author's compilation.

focuses on the design of MALT using a practical rather than pedagogical model, using the ADDIE (Analyse, Design, Develop, Implement, Evaluate) model framework (Yeh and Tseng 2019).

There are a few studies that have focused on improving education systems generally (Chiappe, Amado, and Leguizamon 2020; Derobertmasure and Robertson 2014; Syaifudin and van Rensburg 2018; Yang and Kuo 2020). Some studies focus on the general communication capabilities of technologies within and outside the classroom (Chiappe, Amado, and Leguizamon 2020). Others study how existing technologies can be integrated into lessons widely (Syaifudin and van Rensburg 2018). One study took a broad view of integrating new technology for teaching evaluation (Derobertmasure and Robertson 2014). Rather than focusing on integrating computer- and mobile-assisted technologies into language learning, they have generalized lessons to the entire education system. Yang and Kuo (2020) was the only study that specifically examined how student teachers should adopt strategies for incorporating new technologies into the class.

The technology researchers and administrators opt for is an important aspect of understanding MALT. While mobile applications are relatively new in the market, there are several applications that focus on language learning. The emphasis on research on MALT tends to be on in-house applications or older, existing technologies that do not fully incorporate mobile features. The application of MALT tends to

focus on basic-level language content and skills (Arnold 2007). Since most MALL applications are applied to basic skills, this might be expected. This includes vocabulary and simple grammar structures (Mohamed Kassem 2018). Duolingo, the most popular mobile education application currently available, recently launched an education and testing service. The service is explicitly limited to the basic and intermediate levels of foreign language learning (Ravenscraft 2019). While language learning was a criterion for determining the final inclusion in the systematic review, the majority of research on mobile-assisted learning was language focused, especially on foreign language skills.

Current research on MALL/MALT focuses on how students and teachers adapt to existing technologies, often those that have been implemented at a wide scale. The technology offers efficiencies of scale that lessens burdens on both teachers and learners. Gamification of learning, especially with MALL, is increasingly popular (Schiefelbein, Chounta, and Bardone 2019), but it has usually been applied to existing modes of teaching. Technology, however, regularly evolves quickly. Many firms have been developing new apps in the education sector. These companies have gained large shares in the education market, even creating new innovative products. These firms focus on how to develop educational service software for learners. A popular research approach focused on the attitudes towards technology, i.e., acceptance of technology by the learners or teachers (Nami 2020). However, few of these publications were published in peer-reviewed journals and excluded from the final dataset. Additionally, the quantitative studies in the dataset have limited numbers of observations. Only four studies involved more than 100 observations (Arnold 2007; Kan and Tang 2018; Metruk 2020; Nami 2020). The highest had 381 observations (Nami 2020). The emphasis on qualitative research would benefit from a focus on newer technologies.

Several benefits are identified for teachers adopting computer- and mobile-assisted technologies for language and other topics. Some benefits are logistical. MALT allows asynchronous learning (Liaw 2017), thus increasing student independence (Lafford 2009; Lee and Martin 2020). This increases classroom efficiency, allowing teachers to focus on more advanced lessons. The backend computer processing enables data analytics, including student performance and course evaluation (Derobertmasure and Robertson 2014; M.-H. Liu and Kleinsasser 2015). As Big Data is collected by these platforms and private companies, e.g., social media, the technology will also become more adaptive to the needs of teachers and learners, but this perspective is not covered in the existing research focusing on education.

5. Conclusion

COVID-19 may have forced classrooms to move online, but all of the countries in Southeast Asia have been adopting new ICT technologies in just the past decade, including the Internet, broadband, and cellular technologies. Education systems in Southeast Asia can benefit from MALL/MALT in ways that address the specific obstacles that are faced by countries in the region. Computer- and mobile-assisted learning/teaching enables many of these distances over various terrains to be overcome. Moreover, the lessons for foreign languages may provide more reusable components through technology. Technology can increase teaching efficiency. The new technology may help achieve higher efficiency in teaching. While small class size is a desirable characteristic for classroom instruction, it places higher pressure on the supply of qualified teachers. Lastly, the predominant approach to language teaching, i.e., rote memorization, may create an advantage for technology because repetitive activities are more easily automated. Thus, adopting MALT can provide several opportunities in Southeast Asia. The implications will be considered for classroom contexts in Southeast Asia. The different strategies that are employed with ICT and/or mobile technology differ from traditional classroom learning. These strategies, in turn, differ between educational environments in Southeast Asia and other parts of the world. While these possibilities have

not been uncovered by the systematic review, the studies in the dataset are unlikely to provide any greater insight given the limitations of the research on the topic.

The results of the systematic review within educational research suggest that movement in the intersection of MALL is hampered by limitations in approaches, i.e., assistive technologies. The findings of this study further suggest that there are synergies between the applications and Southeast Asian teaching styles. For instance, while rote learning has limited pedagogical value, its ability to boost learning achievements is enhanced when applied strategically, like language acquisition. Efficiencies are also expected by increasing independent learning activities while simultaneously applying tailored lessons using AI algorithms. Individualized "attention" aligns with proximate learning zones that boost educational outcomes. Variations in student profiles can also be met through the use of technology. Teachers will also be able to improve interactions with students and engage in higher-level learning activities such as evaluation of comprehension.

One of the main omissions in the existing education research is the changing aspects of the role of the teacher when mobile-assisted technologies are introduced into the classroom. While the question is raised in education research (Syaifudin and van Rensburg 2018), it is not found associated with research on integrating MALT into the classroom. The research that mentions teacher training tends to focus on teacher-led forms of education. While this may be natural to assume in education research, the role of the teacher will change dramatically as technologies develop. The prospect of teacher automation is understandably intimidating (Dandalt 2021). Thus, the research exists but in areas that are adjacent to topics on teacher training for computer- and mobile-assisted learning. The research tends to focus on the interactions between the learner and technology (Hwang et al. 2020) or appears in engineering-oriented journals (Zhai et al. 2021).

Yet, one of the most powerful advances in technology generally is the use of Big Data analytics on large volumes of data generated by computer- and mobile-based interactions. Technology is most useful when it increases efficiency and provides new functionality. MALL/MALT applications have demonstrated that it has the potential to deliver these benefits. MALL apps are inherently ICT-enabled, which means that they are ripe for providing Big Data. Yet, the studies reviewed tend to move away from Big Data analytics, focusing on narrow observations. None of the articles in the dataset mentions gamification in relation to teacher training. Further research should involve service providers that can provide access to data but also requires ethics research to ensure no lapses occur. Moreover, much of the research that does focus on integrating teacher perspectives occurs outside of education research, such as engineering (Wong et al. 2015; Zhai et al. 2021).

The limitations of this study involve scoping of the literature that naturally encompasses the literature from an educational perspective. Thus, the bias of educational research must be considered. If the research approached technological applications without considering the pedagogical aspects, i.e., purely technological aspects of applying new technologies, then the results may have found greater applications of newer technologies such as AI and machine learning. The range of applications of mobile-assisted learning technology. This, however, is dependent on the technical language in the field that tends to limit research on how and where the technology is applied. Asynchronous learning that is independent of a teacher may be outside of the purview of the classroom but not outside the scope of the education system. Moreover, technology constantly evolves as it is adopted for implementation. By focusing on technologies currently used in the field, the research often becomes obsolete even as it is published.

Further study that builds on this area is necessary to enable full appreciation of the technologies that are becoming available. Moreover, the full integration of technological capabilities provided by new technologies also requires the input of educators, especially when it involves changing their roles. Rather than limiting research on teacher training based on existing teacher and student roles, research on

education might start from the perspective of how technologies such as CALL and MALL can maximize learner achievements and where teachers can best facilitate activities. In the broader social sciences, the latest technologies are being examined to understand the additive and multiplicative aspects of automation to existing forms of labour (Phelps 2020)—in this case, teachers.

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APPENDIX A

List of Studies

Arnold, N. 2007. "Technology-Mediated Learning 10 Years Later: Emphasizing Pedagogical or Utilitarian Applications?". *Foreign Language Annals* 40, no. 1.

Bozoglan, H. and D. Gok. 2017. "Effect of Mobile-Assisted Dialect Awareness Training on the Dialect Attitudes of Prospective English Language Teachers". *Journal of Multilingual and Multicultural Development* 38, no. 9.

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