

## Challenges and Opportunities of Digitization in Elementary Mathematics and Science Education in Malaysia and Indonesia

Lim Mei Wei<sup>1\*</sup> 

<sup>1</sup>Faculty Faculty of Education, Open University Malaysia, 47301 Petaling Jaya, Selangor, Malaysia.  
Email: vennielimmwei93@gmail.com

### ABSTRACT

#### CORRESPONDING AUTHOR (\*):

Lim Mei Wei  
(vennielimmwei93@gmail.com)

#### KEYWORDS:

Malaysia  
Indoensia  
Digital education  
Online learning  
Science and maths

#### CITATION:

Lim, M. W. (2024). Challenges and Opportunities of Digitization in Elementary Mathematics and Science Education in Malaysia and Indonesia. *Malaysian Journal of Social Sciences and Humanities (MJSSH)*, 9(9), e002987.  
<https://doi.org/10.47405/mjssh.v9i9.2987>

The COVID-19 pandemic has prompted a shift to online learning and digital education for elementary school science and math classes in Malaysia and Indonesia. Both countries are investing in digital education, but Indonesia faces challenges due to a significant rural population and economic disparities. Indonesia has implemented education reforms, including decentralization of the education system and increased educational spending. Likewise, Malaysia is focusing on improving science and math education with technology. Both countries encounter difficulties in implementing digital technology in elementary school classes. The study aims to compare digital education policies and programs for math and science in both countries, highlighting effective approaches and potential challenges, and provide insights for educators and policymakers while exploring opportunities for collaboration and innovation.

**Contribution/Originality:** The paper contributes to a better understanding of the current condition of digital education and the difficulties Malaysia and Indonesia face by compiling all journal papers and documents and visiting the national ministries of education's official websites to provide insights that can help teachers, educators, and elementary school administration.

## 1. Introduction

The COVID-19 epidemic forced a worldwide reevaluation of educational paradigms, which made the quick and broad adoption of online learning necessary. Due to the global shift toward digital, people rely primarily on digital gadgets to learn science and mathematics. Indonesia and Malaysia have made several investments and initiatives in digital education (Nantha Kumar, 2023; Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023). This rapidly adopts digitalization into the classroom and keeps up with global trends that help elementary students build their critical and creative thinking skills, and logical reasoning for self-directed problem-solving. However, the use of digital technology in elementary school science and mathematics classes has revealed long-standing inefficiency, creating challenges for pupils in Malaysia and Indonesia, particularly those who reside in remote or rural areas

(Nantha Kumar, 2023; Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023).

Malaysia is generally more urbanized and developed, but Indonesia has an enormous rural population and more significant economic gaps (Ministry of Education Malaysia, 2013; World Bank, 2023b). However, the Indonesian government has been working to improve human development and education since the early 2000s (World Bank, 2023a). Among the many reforms Indonesia has implemented are the decentralization of the education system, raising the bar for teacher qualifications, and increasing educational spending, which increased by 200 percent in real terms between 2002 and 2018 (Nantha Kumar, 2023). The Malaysian government has improved science and math education with technology (Ministry of Education Malaysia, 2013). Technology use still presents specific difficulties (Nantha Kumar, 2023). This will make it feasible to pinpoint practical solutions and probable hazards to enhance science and math instruction for elementary school students. The study aims to understand better the elementary constraints that prevent the successful application of digital technology in mathematics and science for elementary school pupils in both nations by comparing their policies and outcomes.

Furthermore, the study aims to provide a comprehensive picture of the current state of digital education in Malaysia and Indonesia, highlighting areas that require improvement and opportunities for collaboration and innovation. Therefore, even if Malaysia and Indonesia adopt major educational reforms and digital innovations, this study compares digital education for mathematics and science in both nations. It also deepens our awareness of the range of ways different approaches can be implemented in comparable local circumstances.

### 1.1. Research Objectives

The study aims to achieve the following research objectives:

- i. To understand the key similarities and differences between the digital education policies and programs for mathematics and science in elementary schools in Malaysia and Indonesia.
- ii. To identify the most effective approaches and lessons learned from extensive technology integration initiatives in the elementary schools of both countries for science and mathematics education.

## 2. Literature Review

### 2.1. Malaysia

Malaysia, a federal state in Southeast Asia, has a population of 35,652,659 and ranks 18th in Asia (Worldometer, 2024). It is home to diverse ethnic groups, including Malays, Chinese, and Indians, with 32 ethnic groups in Sabah and 27 in Sarawak.

Malaysia's history dates to 1400 AD and has been influenced by various colonizers, including Portuguese, Dutch, and British. The country's Communist Party of Malaya took power in 1941 as documented by Department of Information Malaysia (2016). The official language is Malay, with English dominating trade and industry. Malaysia's educational system has improved significantly since 1957, and prior to independence, over half of the population lacked formal education, with only 6% of Malaysians

receiving secondary education and 1% pursuing post-secondary education (Department of Information Malaysia, 2016). In 2021, the UNESCO Institute for Statistics (2021) reported 104% elementary and 84% secondary enrollment rates. The government now prioritizes STEM (Science, Technology, Engineering, and Mathematics) and TVET (Technical and Vocational Education and Training) programs to equip students with digital skills, promoting technology integration in education (Nantha Kumar, 2023). Malaysia's education system is predominantly dominated by indigenous students, with 42% of the country's 10,218 schools classified as rural (Nantha Kumar, 2023). Around 22% of these students attend these rural schools (Nantha Kumar, 2023). Financial constraints, such as school supplies, uniforms, and transportation, prevent low-income families in the Bottom 40 (B40) group from accessing high-quality education (Department of Information Malaysia, 2016). Additionally, purchasing digital gadgets is prohibited. The number of people with disabilities in Malaysia has increased from 1.4% in 2017 to 1.5% in 2018, with 453258 in 2017 and 497390 in 2018 (Nagaratnam, 2023). These populations still need access to the internet and necessary gadgets for online learning, causing a digital divide that may widen the gap between students with and without technology access (Nagaratnam, 2023).

Malaysia's government is working to enhance technology integration in education, but challenges remain in ensuring the quality and relevance of educational content (Nantha Kumar, 2023). The ban on smartphone use in schools restricts students' access to technology, hindering their full potential in online learning, particularly in reading and math (Nantha Kumar, 2023; Shanmugam et al., 2019). Teachers must consistently understand the potential advantages of technology integration in the classroom (Nantha Kumar, 2023). Junior teachers use technology more frequently than senior teachers for instructional purposes, presentation materials, and educational resource searches (Nantha Kumar, 2023). Addressing these challenges is crucial for the long-term viability of technology-based education initiatives in Malaysia (Ministry of Education Malaysia, 2013).

The government has recognized the importance and challenges of education technology (Ministry of Education Malaysia, 2013). It's clear that students' critical thinking and problem-solving skills need improvement (Ministry of Education Malaysia, 2013). Malaysian 15-year-old students perform poorly in mathematics and science as shown in (Ministry of Education Malaysia, 2013). This is a challenge that we all must face together. The government and all parties involved must continue to take effective long-term initiatives to develop education through technology. It's a collective mission that requires the commitment and collaboration of everyone involved in the education sector.

## 2.2. Indonesia

Based on Worldometer's (2024) elaboration of the latest United Nations data, 2023, Indonesia, a Southeast Asian archipelago nation with over 273,000 people, is the world's fourth-most populated country and the tenth-largest economy in purchasing power parity. It has made significant progress in poverty reduction, with the poverty rate reduced by over half since 1999. Indonesia is classified as upper-middle-income and is predicted to be the world's fourth-largest economy by 2050 (World Bank, 2023a). However, the country faces serious socioeconomic issues and regional inequality, as rated 116th on the UN Human Development Index (World Bank, 2023a). The country's future looks promising (World Bank, 2023a).

Indonesia, a nation of rich diversity, is home to over 700 distinct ethnic and linguistic groups (World Bank, 2023a). The island of Java alone houses more than 40% of the country's population (World Bank, 2023a). The religious landscape is equally diverse, with approximately 87% identifying as Muslims, 10% as Christians, and the rest comprising Confucianists, Hindus, Buddhists, and followers of other faiths. Indonesia's education system, rooted in Pancasila, the 1945 Constitution, and Act Number 20 of 2003, offers formal, non-formal, and information education at various levels (World Bank, 2023a; Larasati & Mighwar, 2023). The system begins with a 6-year elementary school, followed by 3-year junior high and senior high schools (World Bank, 2023a; Haron et al., 2023). Higher education opportunities are available at universities, institutions, or polytechnics. Notably, there has been a commendable 31% increase in enrollment and spending since 2022, reflecting the government's commitment to education (World Bank, 2023a).

PISA 2022 projects that the COVID-19 pandemic will significantly negatively impact Indonesian students' educational attainment, potentially costing them \$367 in lost future earnings (Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023). Mathematics and science could perform better (Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023). The epidemic has also led to increased financial hardship and income loss rates, with an anticipated 0.13 percentage point increase in elementary school dropout rates by July 2020 (Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023). Secondary dropout rates are expected to rise by 0.15 percentage points, which is explained by lower income and more significant opportunity costs (Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023). Therefore, the government and all parties have made more efforts to improve education in shaping a better future for Indonesian education.

### 3. Research Methods

This study is a collaborative effort that aims to better understand the current condition of digital education and the difficulties faced by Malaysia and Indonesia. By compiling all journal papers and documents from international organizations, including UNESCO, the OECD, and the World Bank, and visiting the national ministries of education's official websites, we hope to provide insights that can help teachers, educators, and elementary school administration. We also aim to determine whether Malaysia and Indonesia might be able to work together to integrate technology into science and math classes for students at elementary schools.

### 4. Results

#### 4.1. Similarities between Malaysia and Indonesia

Both are developing nations these days. Following a shift in online learning brought about by the COVID-19 pandemic, both countries are concentrating on digital education and expediting the incorporation of technology into education (Ministry of Education Malaysia, 2013; Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023).

First, there have been problems for parents, instructors, and students because of the use of technology in the classroom (Al, 2021). One of the biggest obstacles to a student's

participation in virtual learning is limited access to essential technology tools like computers, tablets, and dependable internet connections, which affects the possibilities, results, and learning process (Choiriyah, 2023; Basar et al., 2021; Alenezi et al., 2023). There are educational disparities because of the urban-rural divide (Nantha Kumar, 2023; Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023). The digital infrastructure and facilities in urban areas are vital (Nantha Kumar, 2023; Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023). On the other hand, pupils in remote locations cannot access online educational materials due to inadequate internet connections—Malaysia's countryside, encompassing Sarawak and Sabah (Nantha Kumar, 2023). The countryside of Indonesia is one example (Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023). First rank went to DKI Jakarta Province, where 73.2% of schools have Internet connections (World Bank, 2020). With only 21% of schools having internet access, Papua Province has the least educational connectivity (World Bank, 2020). Distance learning involves a network connection to the internet and comes with additional expenditures for parents, such as purchasing internet capacity (Choiriyah, 2023; Basar et al., 2021; Alenezi et al., 2023).

According to this study, students need help to stay motivated in digitalized and virtual learning environments, which lowers their level of class participation (Nantha Kumar, 2023; Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023). Due to the greater flexibility of virtual learning, students need to work on their academic objectives to avoid procrastinating and losing interest in their academic objectives, which will cause them to become distracted and lose focus throughout the courses (Choiriyah, 2023; Basar et al., 2021; Alenezi et al., 2023).

Teachers must gain a greater understanding of technology and devote more effort and time to mastering it (Nantha Kumar, 2023; Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023). The teacher will have much work to do as a result. A good internet connection helps learning, making creating online learning resources easier (Nantha Kumar, 2023; Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023). Senior teachers are less adept at utilizing online technology, mentoring, and training to use remote learning equipment. Malaysia and Indonesia run a few initiatives to support the instructors (Rizki et al., 2022). They offer training to support educators in developing their technological proficiency and pedagogical approaches in mathematics education. Indonesia, for example, provided the Merdeka Mengajar Platform (Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023).

Careful planning and alignment with educational objectives are necessary to integrate technology seamlessly into present curricula (Nantha Kumar, 2023; Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023). Creating age-appropriate and engaging digital content and resources takes time and resources, so educators must strike a balance between using digital tools and conventional teaching approaches (Nantha Kumar, 2023; Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023). Therefore, young toddlers could be distracted if they are not used appropriately and cautiously. Both nations generally deal with similar issues, but their approaches to solving them vary, as do the results.

## 4.2. Differences between Malaysia and Indonesia

Indonesia, with its vast territory and decentralized system, faces unique and complex challenges in implementing educational technology initiatives ([Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023](#)). In contrast, Malaysia benefits from a more developed infrastructure and centralized approach, leading to distinct approaches in the two countries ([Nantha Kumar, 2023](#)).

Malaysia takes the initiative to promote technology integration in schools ([Ministry of Education Malaysia, 2013](#)). In 2021, the Ministry of Education (MOE), in collaboration with YTL Communications, announced 1BestariNet, a project now operational throughout Malaysia ([Ministry of Education Malaysia, 2013](#)). Unfortunately, that does not work ([Nantha Kumar, 2023](#)). In 2020, the Ministry of Education (MOE) declared that students and teachers could enjoy learning on a modernized digital learning platform. DELiMa, or the "Digital Educational Learning Initiative Malaysia," is the product of years of effort by the ministry and Google, Microsoft, and Apple. DELiMa platform provides the services and apps educators and learners need in the Malaysian educational system, including tools and resources that support digital learning ([Nantha Kumar, 2023](#)). With an average of 1.7 million monthly active users, the platform is one of the largest national deployments in the world ([Nantha Kumar, 2023](#)). With its 2.5 million pupils, 10,000 schools, and 370,000 teachers, Malaysia is rapidly advancing its digital transformation and preparedness for the future ([Nantha Kumar, 2023](#)). Surprisingly, there is no study about using the DELiMa platform to evaluate how well elementary school pupils can learn science and mathematics ([Nantha Kumar, 2023](#)).

Indonesia is working to improve its nation and end poverty ([Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023](#)). Indonesian local governments collaborate with the World Bank to fully comprehend and implement the plan (World Bank, 2020). Internet connectivity is the most critical ([World Bank, 2020](#)). The governments work with schools and the Communication and Informatics Offices (Dinas Kominfo) to create specialized strategies for using technology in schools ([World Bank, 2020](#)). Additionally, the local government provides the initial costs of essential equipment such as modems, routers, laptops or tablets, projectors, and internet packages through budgets known as *Anggaran Pendapatan dan Belanja Daerah* (APBD) or special allocation funds known as *Dana Alokasi Khusus* (DAK) for education ([World Bank, 2020](#)). For high-capacity broadband internet, every school will have access to a fiber-optic network; if this is not possible, mobile broadband connections, LTE, or 3G connections are available. The remaining five percent of schools, primarily found in isolated areas like the interior of Papua, need help connecting to the internet through mobile broadband or fiber-optic networks and have a clear strategy in place from the local government ([World Bank, 2020](#)). Given the high expense of satellite bandwidth, these schools may need to connect via satellite, which would restrict functioning ([World Bank, 2020](#)).

Additionally, to cover the ongoing expenses associated with internet subscriptions by Regular, Kinerja, and Afirmasi (BOS) schools. Indonesian schools give data packages to their teachers ([World Bank, 2020](#)). As a result, pupils may be exposed to more technology, learn more efficiently, and develop 21st-century abilities ([World Bank, 2020](#)). Indonesia's investment in connection can aid in addressing issues such as high inequality, limited school capacity, instructor shortages, and restricted access to

learning resources and curricular materials ([World Bank, 2020](#); [Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023](#)).

### 4.3. Summary

Both countries deal with the same issues in general, but their methods for resolving them differ, as do the outcomes. Malaysia should speak with the Indonesian government about handling fundamental infrastructural problems, particularly in the countryside. Before launching any new platform or project, the Malaysian government should take this seriously to assess and determine the underlying cause and avoid wasting resources like money and labor.

## 5. Discussion

### 5.1. Discussion of the analysis

The potential of government support and initiatives in integrating technology into education offers a beacon of hope, contrasting the Malaysian and Indonesian approaches. The study delves into government initiatives, addressing issues of equity, teacher training, infrastructure and access, digital content quality, and student participation to inspire optimism about the future of education ([Nantha Kumar, 2023](#); [World Bank, 2020](#); [Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023](#)).

Although Malaysia offers a unified framework for ICT integration to guarantee uniformity between schools, centralization does not imply rigidity or make it difficult to adjust to local demands swiftly ([Nantha Kumar, 2023](#)). For example, in line with the Malaysia Education Blueprint 2013–2025, MOE launched 1BestariNet in urban areas to leverage ICT to scale up quality learning nationwide and improve science and mathematics ([Ministry of Education Malaysia, 2013](#)). The MOE launched internet access via 1BestariNet for 10,000 elementary schools, six million school children with 4G internet connectivity, and the virtual learning platform Frog Virtual Learning Environment (Frog VLE) in 2011 ([Nantha Kumar, 2023](#)). This project cost more than RM663 million ([Nantha Kumar, 2023](#)). The Auditor General Report 2013 reported that over 8000 schools failed to use the facilities ([Nantha Kumar, 2023](#)). Additionally, MOE introduced many ICT programs, such as Computer in Education and Computer Literacy Project, to encourage the use of computers in the classroom ([Ministry of Education Malaysia, 2013](#); [Nantha Kumar, 2023](#)). Regretfully, this facility was used less, and this project lost money and labor ([Nantha Kumar, 2023](#)). Even while the government frequently provides funding for large-scale projects and programs, it must evaluate its benefits and viability. Economic swings impact sustained funding levels ([Nantha Kumar, 2023](#)).

The need for internet infrastructure continues to be a barrier to using technology in the classroom ([Ministry of Education Malaysia, 2013](#); [Nantha Kumar, 2023](#)). The teacher must have adequate skills and the readiness to adapt to the new technologies ([Ministry of Education Malaysia, 2013](#); [Nantha Kumar, 2023](#)). The inefficient internet access and high time consumption of preparing the digital materials lead to the teacher's attitude towards the technology, poor telecommunication signal, and the absence of a telecommunication signal tower in the affected areas ([Ministry of Education Malaysia, 2013](#); [Nantha Kumar, 2023](#)). As a result, the affected schools could not use the Frog VLE,

and teachers preferred not to use it, lowering student learning motivation (Ministry of Education Malaysia, 2013; Nantha Kumar, 2023; Nagaratnam, 2023; Mahsusi et al., 2023). The teacher will deliver theory like traditional math and science instruction, failing to develop the pupils' motivation and cognitive ability. Students will feel bored and have less desire to learn science and math because of this. Children who were raised in the digital age adore using digital gadgets (Ministry of Education Malaysia, 2013; Nantha Kumar, 2023). There is a significant academic impact on the students.

With Malaysia's planned training strategy, teachers are guaranteed a high level of ICT proficiency (Ministry of Education Malaysia, 2013; Nantha Kumar, 2023; Nagaratnam, 2023). The government encourages technology integration into the current curriculum, but doing so calls for careful preparation and alignment with learning goals (Nantha Kumar, 2023). Teachers and students may both benefit from this. Malaysia introduced DELIMa; interestingly, not much research about the DELIMa platform has been done (Nantha Kumar, 2023). However, the government must spearhead initiatives to detect innovation or destructive technologies that may cause significant implications for the local education system, such as the duration of training for teachers, any platform, or digital education that is quickly adopted (Nantha Kumar, 2023). For this, the government must always be transparent that education is about educating and preparing the future workforce (Nantha Kumar, 2023). Thus, adopting any technology must be done correctly with proper due diligence assessment and cost-benefit analysis (Nantha Kumar, 2023). Malaysia has an environment conducive to technology integration because of its more developed infrastructure and higher internet penetration rate; however, continuous efforts are required to connect rural areas' geographically limited infrastructure (Ministry of Education Malaysia, 2013; Nantha Kumar, 2023; Nagaratnam, 2023).

Compared to Indonesia, they have endeavored to improve the quality of instruction and learning, as indicated in the World Bank's Growing Smarter report; nonetheless, significant challenges remain. Indonesia plans several initiatives to improve the infrastructure (World Bank, 2020; Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023). One is the Merdeka Mengajar Platform (PMM), an almost complete platform that can encourage teachers to develop their professional skills in digital tools (World Bank, 2020). Teachers play an essential role in the world of education to provide better education and quality learning to students. The research on utilizing PMM shows that teachers know how to use technology to assist their teaching and are more proficient in using various platforms or applications in teaching (World Bank, 2020; Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023). Teachers can improve competencies and keep updating their knowledge and skills to ensure the best learning quality (World Bank, 2020; Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023). This is an excellent start for Indonesia to improve its educational system (World Bank, 2020; Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023).

The Indonesian government is working to enhance infrastructure, investing heavily in connecting remote areas, yet geographic diversity makes infrastructure development more difficult and expensive (World Bank, 2020; Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023). The inconsistency in funding is the root cause of disparities in resources and educational quality. Compared to Indonesia, they have endeavored to improve the quality of instruction and learning, as

indicated in the World Bank's Growing Smarter report; nonetheless, significant challenges remain. Indonesia plans several initiatives to improve the infrastructure (World Bank, 2020; Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023). One is the Merdeka Mengajar Platform (PMM), an almost complete platform that can encourage teachers to develop their professional skills in digital tools (World Bank, 2020; Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023). Teachers play an essential role in the world of education to provide better education and quality learning to students. The research on utilizing PMM shows that teachers know how to use technology to assist their teaching and are more proficient in using various platforms or applications in teaching (World Bank, 2020; Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023). For this, teachers can improve competencies and keep updating their knowledge and skills to ensure the best quality of learning (World Bank, 2020; Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023). This is an excellent start for Indonesia to improve its educational system. The Indonesian government is working to enhance infrastructure, investing heavily in connecting remote areas, yet geographic diversity makes infrastructure development more difficult and expensive (World Bank, 2020; Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center, 2023). Inconsistent funding is the root cause of disparities in resources and educational quality.

## 5.2. Recommendations for further investigation

In addition to the difficulties experienced by students, teachers, and school administrators, this research covered the steps and obstacles made by the governments of Malaysia and Indonesia, such as funding. The material for this study was gathered by visiting the official websites of the national ministries of education and compiling all journal articles and documents from international organizations, such as UNESCO, the OECD, and the World Bank. The possibilities and difficulties of integrating technology into science and mathematics teaching in Malaysian and Indonesian elementary schools must be better covered and discussed in this study. Due to a lack of information, this study cannot delve further into the subjects to comprehend the impact of education technology integration in both nations. More research needs to be done to find out how integrating technology into teaching practices affects teachers and students. It is possible to conduct qualitative research by interviewing a few primary school teachers who integrate platforms like the Merdeka Mengajar Platform (PMM) in Indonesia and DELIMA in Malaysia to teach science and mathematics. Data can be collected to comprehend the difficulties of technological integration in education fully. Thus, this study can assist teachers, educators, and primary school administration in using technology to help elementary children enhance their critical thinking and problem-solving abilities in mathematics and science.

## 6. Conclusion

The COVID-19 pandemic has had a significant detrimental effect on student's performance and learning. Our most excellent resource and the foundation that will help us prepare for the challenges of the twenty-first century is our children. Elementary school students are expected to exhibit critical thinking, creative problem-solving, and logical reasoning, all of which are indispensable components of 21st-century skill development. Students in Malaysia and Indonesia performed worse in science and mathematics than students in other nations. To ensure students are equipped for the

demands of the twenty-first century, the collaboration between the governments of both nations is crucial. This collaboration aims to integrate digital technologies into science and mathematics curricula seamlessly, demonstrating our shared commitment to the future of our students.

This study has thoroughly examined the primary areas of overlap and difference in the digital education policies and programs of Malaysia and Indonesia, excluding the topics of science and math for elementary school pupils. The report also discusses the best practices and lessons learned from the extensive technological integration efforts in both countries. The findings of this study highlight the potential benefits of future research in this area, which will be advantageous to both nations.

Overall, Malaysia and Indonesia have made significant strides in digital education, but both face unique challenges. Malaysia benefits from more developed infrastructure and a centralized approach, while Indonesia's vast geography and decentralized system present more complex barriers. The needs of all students, teachers, and schools should be given priority in Malaysia's well-rounded education technology implementation. Creating infrastructure and technology that is more accessible to everyone is part of this. This is to guarantee that no learner in the digital age is left behind and that everyone has access to and benefits from technology-enhanced education. Although Indonesia has a well-defined plan for implementation, it must make sure that funds are allocated for technology education in a way that balances resource availability and educational quality. Together, Malaysia and Indonesia can enhance the educational system. Malaysia may advise the Indonesian government on how to address fundamental infrastructure issues, especially in rural areas. To improve their ICT integration methods and ultimately strive for an inclusive, efficient, and progressive learning environment, both nations can collaborate and be part of a larger mission for the advancement of digital education.

### **Acknowledgement**

I would like to express my gratitude to Open University Malaysia for providing resources of journal articles. Part of this article was extracted from a master degree's article submitted to Open University Malaysia, Kuala Lumpur.

### **Funding**

This study received no funding.

### **Conflict of Interest**

The author reported no conflicts of interest for this work and declare that there is no potential conflict of interest with respect to the research, authorship, or publication of this article.

## References

- Al, C. P. E. (2021). Distance Learning In Primary Schools During The Covid-19 Pandemic In Indonesia: Challenges, Solutions, And Projections. *Türk Bilgisayar Ve Matematik Eğitimi Dergisi*, 12(4), 263–270. <https://doi.org/10.17762/turcomat.v12i4.502>
- Alenezi, M., Wardat, S., & Akour, M. (2023). The Need of Integrating Digital Education in Higher Education: Challenges and Opportunities. *Sustainability*, 15(6), 4782. <https://doi.org/10.3390/su15064782>
- Basar, Z. M., Mansor, A. N., Jamaludin, K. A., & Alias, B. S. (2021). The Effectiveness and Challenges of Online Learning for Secondary School Students – A Case Study. *Asian Journal of University Education*, 17(3), 119. <https://doi.org/10.24191/ajue.v17i3.14514>
- Choiriyah, S. (2023). Evaluating Digital Learning Application in University Setting: Indonesian Students' Experiences, Challenges, And Learning Effectiveness. *Jurnal Penelitian Pengembangan Pembelajaran Dan Teknologi (JP3T)*, 1(2), 87–95. <https://doi.org/10.61116/jp3t.v1i2.138>
- Department of Information Malaysia. (2016). *MyGOV - the government of Malaysia's official portal*. The Government of Malaysia's Official Gateway. <https://www.malaysia.gov.my/portal/content/30120>
- Global Education Monitoring Report Team & SEAMEO Regional Open Learning Center. (2023). *Technology in education: a case study on Indonesia*. UNESCO. <https://doi.org/10.54676/wjmy7427>
- Haron, H., Sajari, A., Dewanti, R., Ganesan, Y., & Gui, A. (2023). Digital Transformation In Community Development Of Malaysia And Indonesia. *ICCD*, 5(1), 232–242. <https://doi.org/10.33068/iccd.v5i1.591>
- Larasati, N. S., & Mighwar, N. M. A. (2023). History of the Development of Education in Indonesia. *HISTORICAL Journal of History and Social Sciences*, 2(3), 142–150. <https://doi.org/10.58355/historical.v2i3.85>
- Mahsusi, M., Hudaa, S., Nuryani, N., Bahtiar, A., & Subuki, M. (2023). Integrated Application-Based Digital Learning Technology in Successful Learning Activities During the Pandemic. *Journal of Applied Engineering and Technological Science (JAETS)*, 4(2), 633–643. <https://doi.org/10.37385/jaets.v4i2.1449>
- Ministry of Education Malaysia. (2013). Malaysia Education Blueprint 2013-2025 (Preschool to Post-Secondary Education). *Ministry of Education Malaysia*. <https://www.pmo.gov.my/wp-content/uploads/2019/07/Malaysia-Education-Blueprint-2013-2025.pdf>
- Nagaratnam, A. (2023). Challenges and Inefficiencies of Online Education among Malaysian Students. *International Journal for Multidisciplinary Research*, 5(6). <https://doi.org/10.36948/ijfmr.2023.v05i06.9603>
- Nantha Kumar, S. (2023). Technology in education: a case study on Malaysia. *UNESDOC*. <https://doi.org/10.54676/qxeg1330>
- Rizki, P. N. M., Handoko, I., Purnama, P., & Rustam, D. (2022). Promoting Self-Regulated Learning for Students in Underdeveloped Areas: The Case of Indonesia Nationwide Online-Learning Program. *Sustainability*, 14(7), 4075. <https://doi.org/10.3390/su14074075>
- Shanmugam, K., Zainal, N. K., & Gnanasekaren, C. (2019). Technology Foresight In The Virtual Learning Environment in Malaysia. *Journal of Physics Conference Series*, 1228(1), 012068. <https://doi.org/10.1088/1742-6596/1228/1/012068>
- UNESCO Institute for Statistics (UIS). (2021). *Bulk Data Download Service*. UNESCO UIS. <https://uis.unesco.org/bdds>

- World Bank. (2020). The promise of education in Indonesia. *World Bank Group*.  
<https://doi.org/10.1596/34807>
- World Bank. (2023a). Indonesia Overview. *World Bank Group*.  
<https://www.worldbank.org/en/country/indonesia/overview>
- World Bank. (2023b). Malaysia Overview. *World Bank Group*.  
<https://www.worldbank.org/en/country/malaysia/overview>
- Worldometer. (2024). Population by Country (2024) - Worldometer. *Worldometer*.  
<https://www.worldometers.info/world-population/population-by-country/>