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Optimizing Teachers' Autonomy to Use Information and Communications Technology in Indonesian Classrooms

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Key Messages

- Teachers play a critical role in the successful integration of Information and Communications Technology (ICT) into Indonesian classrooms. Indeed, teachers are the primary drivers of ICT adoption, and their ability to exercise the autonomy granted by the Government to use these ICT tools has an impact on improving learning outcomes.
- Nevertheless, barriers to the adoption of ICT in Indonesian classrooms exist. For example, in rural areas, inadequate familiarity with ICT tools sometimes results in outright rejection amongst educators. Conversely, urban teachers, benefiting from robust digital infrastructure and in turn, greater connectivity, grapple with an excess of ICT tools and training options.
- A Strategic Education Roadmap is essential to align the Government's efforts, clarifying objectives and coordinating actions for effective ICT integration into Indonesia's education sector. Such a roadmap should encompass the Ministry of Education, Culture, Research and Technology (MOECRT) and the Ministry of Religious Affairs of Indonesia (MORA) tailored approaches, providing clear guidance to local governments and schools. At the forefront should be a commitment to fostering digital skills and familiarity with technology amongst students and educators, as exemplified by Malaysia's Education Blueprint (Box 1).
- Enhancing Indonesian teachers' adoption of ICT requires holistic training materials that integrate pedagogy with technical skills. Addressing any reluctance to adopt technology in the learning process would benefit from localized approaches, aligning tools with cultural context and daily practices.

The Rise of ICT Use during the Covid-19 Pandemic

Efforts to digitize Indonesia's education sector are ongoing, however the unprecedented Covid-19 pandemic escalated the need for reform (UNICEF, 2021). Due to school closures and the enactment of social distancing measures, teachers and students had to adjust to online learning and adopt information and communications technology (ICT) tools in order to continue their studies.

Such a rapid transition forced teachers to experiment with new ways of engaging students by leveraging various digital platforms including video conferencing tools, and other online resources (Mahdum et al., 2019). Due to the circumstances, the Ministry of Education, Culture, Research and Technology (MOECRT), granted schools the autonomy to utilize any ICT tools that best met their needs through the Distance Learning Guide (Rasmitadila et al., 2020; Ministry of Education and Culture [MOEC], 2020a). Going forward, these changes to policy are further supported by the *Merdeka Belajar* initiative.¹

Within the education sector, autonomy² refers to empowering schools with greater decision-making powers, facilitated through the concept of School-Based Management (*Manajemen Berbasis Sekolah* or SBM). The concept was first introduced through Law No. 32/2004 on Regional Government and Law No. 33/2004 on Financial Balance between the Central Government and Regional Governments and extends to teacher management, funding allocation, principal recruitment, and management of the teaching-learning process. The aim is to enhance the quality and relevance of education. In the context of ICT adoption, integrating tools in schools is a progressive step toward effective education, aligning with contemporary demands and preparing younger generations for future labor market demands.

Autonomy to implement ICT is supported by MOECRT's *Merdeka Belajar* policy. This policy aims to address pandemic-induced learning loss by emphasizing competency-based and flexible learning while upholding *Pancasila* principles. More detailed discussion of the *Merdeka Belajar* policy is set out later in this paper. However, ICT autonomy allows each school to manage and deliver its own learning program based on its individual circumstances, whilst still recognising the diversity and availability of resources across Indonesia.

The transition from in-person learning to remote learning posed significant challenges, with lessons having to be adapted for online delivery in the face of Covid-19 (Mirzajani et al., 2015; UNICEF, 2021). Collaborative online platforms and virtual classrooms provide opportunities for interactive discussions, group projects, and peer-to-peer learning by fostering engagement and collaborative skills among students (Rashid & Asghar, 2016). However, delivery and effective adoption of ICT policies were impacted by each school's geographical location within Indonesia. As a result, teachers had to reconsider their teaching methods and trial new pedagogical approaches.³

With the end of pandemic distancing restrictions, and a return to face-to-face teaching, some may now question the need to continue with ICT in the education sector. However, there are merits to continuing to promote ICT in schools, specifically, by adopting a hybrid approach going forward. A hybrid approach combines the benefits of in-person instruction with the flexibility and inclusivity offered by digital technologies. Moreover, the adoption of multimedia resources, such as educational videos, simulations, and gamified content, has added an element of interest and interactivity to the learning process. In turn, this has enhanced student motivation and comprehension (Li et al., 2022).

It is important to recognise such achievements and innovations because they demonstrate the potential of ICT integration into education beyond the pandemic. This includes the impact of widespread ICT adoption in education

¹ See discussions on Government Initiatives.

² The term is defined in the Law No. 23/2014 on Regional Governance as the self-governance of a region in the process of decision-making and execution of diverse matters within its jurisdiction, one of which is education.

³ Pedagogy encompasses the array of teachers' ideas, beliefs, attitudes, knowledge, strategies, and techniques they employ to effectively facilitate learning, promote student engagement, and shape the teaching and learning process in the classroom (Westbrook et al., 2013).

as a key driver in realizing Indonesia's goal of developing a highly skilled workforce. President Joko Widodo has repeatedly emphasized that the nation must be prepared to face the global challenges of the Fourth Industrial Revolution⁴, where emerging technologies continue to grow rapidly (State Secretariat, 2019).

Rollout of ICT technology and its adoption in Indonesian classrooms has been relatively slower at the primary education level, compared to secondary schools and universities.⁵ The driving discourse around digitalizing the Indonesian education system has primarily centered around the higher levels of education (senior secondary and higher education) to teach final-year subjects and facilitate practicals in order to promote students' readiness in meeting future job market demands (MOEC, 2019; MOEC, 2020b). This underscores the crucial role of ICT technology utilization in workforce development.

Nonetheless, it is also imperative to integrate ICT use at an even earlier stage as children are growing up in a digital age where technology is pervasive. According to the World Economic Forum (2016), 65% of children entering primary school today will work in jobs that currently do not exist. Early exposure to ICT is proven to ensure student readiness for the demands of the 21st century (UNESCO, 2018). Furthermore, effective ICT use at the primary education level also promotes greater knowledge of core subjects by enriching the learning experience through interactivity and engagement (UNESCO, 2018).

Optimizing ICT also promotes a more equitable distribution of learning opportunities. This is especially true for students in rural areas, granting them access to valuable resources and equalizing opportunities across the country. During the pandemic, it became evident that Indonesian students with internet access experienced less learning loss when compared to those without any internet access (World Bank, 2023). Amongst students where access to education remained limited, disparities in learning outcomes further widened. Consequently, this inequality may weaken the nation's future ability to compete on a global scale.

According to the Organization for Economic Cooperation and Development's (OECD) 2022 Programme for International Student Assessment (PISA) report, Indonesia ranked 72 out of 80 countries in reading, 71 out of 80 countries in science, and 77 out of 80 countries in mathematics. The PISA assessment measures the literacy performance of 15-year-olds in reading, math, and science, revealing the country's comparatively low quality of education. This assessment signifies the importance of addressing these learning gaps as early as possible.

⁴ Also known as "Industrial Revolution 4.0 (4IR), the Fourth Industrial Revolution refers to a technological shift that merges the physical, digital, and biological worlds, enabled by emerging technologies (i.e. artificial intelligence, robotics, the Internet of Things, blockchain, etc) that is impacting all disciplines, economies and industries, and even challenging ideas about what it means to be human (World Economic Forum, 2018).

⁵ See discussion on ICT Use in Different Classroom Contexts: Scope and Regional Disparities.

ICT Use in Different Classroom Contexts: Scope and Regional Disparities

The use of ICT in the classroom may include a wide range of learning-related tools. According to the Director General of Teachers and Education Personnel of MOECRT (2023), “(T)he government does not impose limitations on the platforms that schools can use,” allowing for diverse utilization of ICT tools across Indonesia. These tools can vary from simple daily communication applications to creative and educational tools. Further detail is provided in Table 1:

Table 1.
Examples of ICT Usage in Indonesian Classrooms

Usage	ICT Tools
Video conferencing (remote learning)	Zoom, Google Meet, Cisco Webex
Learning Management System (LMS)/ Monitoring Student's digital activities	Jamteacher, Gredu, Quintal, Classroom Application, Moodle, Canvas, Blackboard
Interactive Content Creation	Canva, Microsoft PowerPoint, Google Forms, Flipgrid
Gamified Learning	Kahoot, Quizizz, Quizlet
Online Communication and Collaboration	WhatsApp, Facebook, Google Classroom, Google Docs, Microsoft Teams
Educational Resources (inc. audio-visual content, e-book, teaching modules)	Merdeka Mengajar, belajar.id, Google, YouTube, TikTok, Google Scholar

Source: Aswan, 2020; MOECRT, 2023; Palupi and Raharjo, 2020; Prasetyo and MS, 2021; Focus Group Discussion with P2G & IGI, 2023

Although the adoption of ICT tools skyrocketed as schools relied on them to facilitate the transition to distance and online learning, takeup varied across platforms and software packages. WhatsApp remains the most widely used tool due to its simplicity. Moreover, WhatsApp is the least data-intensive platform when compared to others such as Zoom or Google Meet, which can be inaccessible for teachers dealing with connectivity or infrastructure challenges. Considering platforms such as WhatsApp were not initially designed for educational purposes, its utilization showcases the versatility and adaptability of ICT technologies in addressing challenges encountered in the education sector.

The current state of ICT use in Indonesian schools reveal both challenges and opportunities for growth. Despite lessons learned from the Covid-19 pandemic, ICT implementation and adoption remains limited, particularly in primary and secondary schools, as well as rural areas. According to Statistics Indonesia (2021), internet usage in urban areas measures 71.81%. This is compared to 49.30% for those in rural areas. The highest percentage of internet access is found in DKI Jakarta with 85.55%, whereas this number drops to 26.49% in Papua, illustrating a significant disparity in access to supporting infrastructure.

Moreover, MOECRT's Center for Data and Information Technology (PUSDATIN) (2021) revealed that only 7.80% of primary schools and 43.68% of junior secondary schools have access to computer labs. However, at the senior secondary school level, this number increases significantly to 73.31%. These findings also correspond to the percentage of students that have incorporated computer usage in their education. According to Statistics Indonesia (2022), only 5.04% of primary school students use computers in their learning process, while junior secondary school students and senior secondary school students demonstrate a 17.80% and 33.12% percentage respectively. Higher education students reveal the highest percentage of computer use in their studies at over 50% (Statistics Indonesia, 2022).

Government Initiatives

As previously identified, the Indonesian government has placed digitalization at the forefront of its education sector agenda (MOECRT, 2022). The pursuit of this goal involves harnessing the transformative power of ICT to achieve tangible outcomes such as extending educational access to remote areas, offering a diverse range of learning materials and online courses, and imparting essential digital skills (Rizal et al., 2019). Collectively, these efforts help improve the quality and competitiveness of the workforce, which is reflected in Indonesia's National Medium Term Development Plan (*Rencana Pembangunan Jangka Menengah Nasional* or RPJMN) 2020–2024, where it is identified as a designated national priority.

The *Merdeka Belajar* policy is a key initiative from MOECRT and provides overarching reforms to cater to the demands of the Industrial Revolution 4.0 era. Launched in 2019, *Merdeka Belajar* encompasses a range of programs, referred to as “episodes”, which address various educational reforms (Azmi and Iswanto, 2021). As of April 2024, *Merdeka Belajar* consists of 26 episodes, including *Kurikulum Merdeka* (*Merdeka Curriculum*).

The *Merdeka Curriculum* was introduced by MOECRT to keep up with the changing education landscape brought by digitalization, and mitigate learning loss as result of the Covid-19 pandemic (Randall et al., 2022). Integration of ICT into teaching and learning processes, as well as enabling schools to exercise their autonomy, are two of the main characteristics of this curriculum (Novita et al., 2022). Like its namesake which means “freedom”, the curriculum seeks to grant students, teachers, and schools more autonomy and flexibility in the educational process. It is hoped that teachers can now implement personalized instructions, tailored to students' unique skills, whilst adjusting to local contexts and content.

Through the *Merdeka Belajar* initiative, MOECRT has developed digital platforms to complement and support the implementation of its policies (Saputro et al., 2022). Among these platforms, Platform *Merdeka Mengajar* (PMM) serves as a centralized hub for educational resources, offering teachers access to materials provided by the government, as well as original content created by fellow teachers from across Indonesia. This platform has created opportunities for collaboration and knowledge sharing amongst teachers from diverse regions, bridging the geographical divide. For instance, teachers from remote areas in the easternmost part of Indonesia, such as Papua, can now exchange ideas and experiences with their counterparts in the western-most regions, such as Aceh. This promotes a sense of camaraderie and allows for the sharing of best practices (Interview with the National Coordinator of P2G, 2023; Interview with Director General of Teachers and Education Personnel, 2023).

The PMM is further supported by government programs such as *Guru Penggerak*, which aims to improve teachers' performance as leaders by promoting a variety of positive behaviors, including ICT adoption, through targeted training programs. These programs have not only contributed to the professional development of teachers but also fostered a sense of unity and collective growth within the teaching community, particularly amongst educators in the frontier regions (*Wilayah 3T*)⁶ (Sibagariang et al., 2021; Interview with Director General of Teachers and Education Personnel, 2023). Teachers can also utilize the support of *Balai Guru Penggerak*, a provincial-level entity that facilitates offline training.

Prior to the pandemic, the Center for Data and Information Technology under MOECRT had introduced a teacher training program specifically aimed at providing technical guidance and enhancing ICT skills (Center for Data and Information Technology, 2022). Dubbed *PembaTIK* or *Pembelajaran Berbasis TIK* (ICT-based Learning), the program is still in operation and adheres to UNESCO's ICT Teacher Competency Standards. The program is open to both government and non-government-employed teachers, as well as school principals, and applies across all subjects.

⁶ Frontier regions (*wilayah 3T*, tertinggal, terdepan, terluar) comprise 62 regencies that have been identified as remote, frontier, and underdeveloped compared to the national average.

However, one of the main challenges of *PembaTIK* is its exclusive online format. This aspect of the training may present a challenge for individuals with limited access to ICT resources. *PembaTIK* also does not apply to teachers employed by the Ministry of Religious Affairs (MORA), as they conduct their own training (based on the respective regional religious departments), albeit in a sporadic manner. In line with this, MORA has provided training sessions through their independent Massive Open Online Course (MOOC) named *Pintar* (MORA, 2023). The digital platform is also part of MOECRT's Merdeka Belajar initiative, and was designed to facilitate online training for educators under MORA, with the aim of reaching a wider audience.

Currently, MOECRT is in the process of developing the Indonesian Education Roadmap 2020-2023, encompassing *Merdeka Belajar* and its comprehensive range of initiatives (MOECRT, 2021). However, the document remains in draft form due to criticisms raised in 2021 regarding educational aspects such as religious teachings.⁷ The draft itself highlights the significant challenges Indonesia faces, including shifting demographics, a low digital literacy rate, and the pressing need for enhanced human resources.

Box 1.
Malaysia Education Blueprint (2013-2025: Preschool to Post-Secondary Education)

The Malaysia Education Blueprint sets out the nation's vision of the education system, incorporates student's aspirations within the greater national strategic interests, and proposes several major shifts in education policy required to achieve that vision.

In doing so, the Blueprint sought to achieve three objectives:

1. Understanding the current performance and challenges of the Malaysian education system. Issues regarding improving access to education and raising standards (quality) are among the foremost concerns.
2. Establishing a clear vision and aspirations for individual students and the education system as a whole over the next 13 years.
3. Outlining a comprehensive transformation programme for the system, including key changes to the Ministry.

The Blueprint has also identified 11 shifts to transform the education system to meet this vision, with one of them explicitly tied to digital transformation and ICT use in schools. Shift 7, which promotes the education system to "**Leverage ICT to Scale Up Quality Learning Across Malaysia**", reflects such a case.

The Blueprint goes on to highlight the rationale behind the shift ("why is it needed"), signifying the urgency of driving more policies to address ICT usage in schools. The expected outputs and outcomes of the shift is also explained clearly ("what will success look like?"), demonstrating how ICT use will impact schools, teachers, principals and students, as well as clarifying the long-term goals that the Malaysian Ministry of Education wants to achieve through optimizing ICT in classrooms.

In addition, the Blueprint also details the specific work programs beginning in 2013 that will help "leverage ICT". Among them:

1. **Provide internet access (4G network) and virtual learning environments via digital partner for all 10,000 schools by 2013.** This digital infrastructure will facilitate collaboration between teachers, students, and parents to share and develop learning resources, as well as communicate virtually. Significant investments will also be made in ICT-competency training for all teachers and improving the device-to-student ratio (1:10 by 2020). The Ministry will also implement cost-efficient solutions by investing in fit-for-purpose devices such as basic computers or low-cost laptops, as well as utilizing

⁷ See article regarding the criticism on religion in the Roadmap.

less resource-intensive alternatives for ICT facilities compared to current computer labs, such as a lending library for notebooks and computers-on-wheels.

- 2. Augment online content to share best practices starting with a video library in 2013 of the best teachers delivering lessons in Science, Mathematics, Bahasa Malaysia, and English language.** This resource can be used by teachers for inspiration, or even by students as a revision tool.
- 3. Maximize the use of ICT for distance and self-paced learning to expand access to high-quality teaching regardless of location or student skill level.** Pilot programmes for these innovations will be rolled out from 2016, with successful programmes scaled up nationwide.

Source: The Malaysian Ministry of Education, 2013

Teachers as the Main Driver of ICT Adoption

Improved ICT adoption across regions and education levels in Indonesia relies on the collective efforts of various stakeholders such as local governments, school administrators, and parents (Randall et al., 2022; Novita et al., 2022; ProVisi Mandiri Pratama, 2023). However, teachers remain at the center of the educational process, especially at certain levels, such as primary school where students need the most support (Ferrero et al., 2021). Consequently, quality education depends on teachers' ability to effectively make use of ICT. (Salim et al., 2023). A number of factors determine teachers' effective use of ICT. They are discussed in the following sections.

The Paradox of Choice

The autonomy of schools and teachers in choosing what and how to integrate ICT tools into classrooms has paradoxically presented a unique challenge. As reiterated by the National Coordinator of P2G (2023), the multitude of ICT technologies available to educators has overwhelmed them when not accompanied by proper training and information. There are currently at least 59 education technology (EdTech) companies operating in Indonesia, and the number keeps growing (Tech in Asia ID & Pijar Foundation, 2023). An influx of options may burden teachers as they strive to keep pace with emerging technologies, along with the necessary technical training required (Interview with the National Coordinator of P2G, 2023).

It becomes critical then, to provide teachers with comprehensive guidance on the selection of suitable ICT tools. However, this guidance should not endorse certain tools or platforms; instead, it should provide ways to select ICT tools that align with teachers' specific pedagogical needs, fostering effective teaching and learning. As such, the focus lies on the methodology of choosing these ICT tools. In practice, training efforts have predominantly focused on the technical aspects of operating specific ICT tools or integrating them into classrooms. This echoes the general approach to ICT adoption, especially during the pandemic, which was focused on the provision of digital infrastructure and tools such as Chromebooks, equipping schools with computer labs, and internet quotas (Middle School Directorate, 2022; MOECRT, 2020b; Focus Group Discussion with P2G & IGI, 2023; Interview with the National Coordinator of P2G, 2023).

This lack of guidance is exacerbated by the absence of specific metrics or parameters to monitor and assess teachers' digital skills. Currently, the government primarily focuses on assessing student learning outcomes through the *Rapor Pendidikan* platform⁸ as an indirect measure of teachers' performance (Interview with the Director General of Teachers and Education Personnel, 2023). This can have implications for measuring the effectiveness of teacher training programs.

⁸ Rapor Pendidikan is an assessment and reporting system that enables the tracking and evaluation of students' learning progress. By utilizing data-driven education improvement plans, this platform identifies areas for improvement, fosters reflection, and enhances the overall quality of education in Indonesia.

Inequality of Internet Access

Inequity in access to digital infrastructure also impacts on the effective use of online and digital learning opportunities by teachers. Teachers in rural areas are faced with internet connectivity issues and frequent blackouts brought about by the lack of adequate infrastructure. This in turn, greatly impacts rural teachers' capacity to teach their students (Interview with the National Coordinator of P2G, 2023; Focus Group Discussion with teachers in East Nusa Tenggara, 2022). Furthermore, the International Telecommunication Union (2021) reports that 19% of schools in Indonesia have yet to be connected to the internet. As an archipelago of over 18,000 islands, Indonesia has considerable socio-demographic differences that affect the digitalization of education. Currently, the use of digital platforms is concentrated on Java (UNICEF, 2021; East Ventures, 2022), an area with higher levels of access to necessary infrastructure and households with internet access.

The implications of limited access to ICT in education are concerning, as government programs and interventions may not be effectively rolled out across Indonesia (Mirfani, 2019). There is a need to reassess the current approach and explore alternative methods in the delivery of training. Online government interventions, such as webinars like those offered under *PembaTIK*, may not reach teachers in remote areas due to their lack of devices and infrastructure (Focus Group Discussion with teachers in East Nusa Tenggara, 2022).

Perversely, and despite the numerous training provided by government and industry stakeholders to promote digitalization in education, these trainings have inadvertently also contributed to a widening gap in digital literacy amongst teachers in Indonesia (Interview with the National Coordinator of P2G, 2023; World Bank, 2022). Whilst online workshops, behavioral change efforts and training aim to reach a broader regional audience, those who already have access to ICT are ultimately the ones who benefit the most in terms of acquiring new knowledge and improving their skills. Indeed, a survey on teacher training programs in Indonesia found that older teachers and those in rural areas are less likely to participate in online training as compared to their younger, urban counterparts. Access to the internet and technology were cited as main barriers to participation (World Bank, 2022). The survey also found that the proportion for rural teachers that completed online training (once commenced) was much lower than for urban teachers (World Bank, 2022).

Local governments also have an important role to play in filling in the gap left by centralized programs under *Merdeka Belajar*. However, the bureaucratic nature of local administrations hinders swift adaptation to technological advancements, influencing the quality of education within some jurisdictions. Numerous regional governments, particularly at the municipal and district levels, lack the requisite capabilities, both in terms of knowledge and human resources, to develop and administer policies aimed at improving educational outcomes. The successful implementation of government programs at the regional level is crucial, as schools are managed by local governments (Yatun et al., 2021).

While the central government may develop and promote various policies and programs, the support and alignment of regional governments must be improved to ensure consistency and coherence with the national agenda (Mirfani, 2019; Interview with the National Coordinator of P2G, 2023). A total of 77 policies and programs linked to teacher reform are scattered across 43 districts and municipalities. The regulatory complexity of this situation is exemplified by the fact that a mere 9% of regional government policies explicitly focus on augmenting teacher quality through the enhancement of their pedagogical skills and knowledge (Bima & Yusrina, 2018).

Attitude Towards, and Familiarity with Technology

As already noted, a clear rural-urban divide exists in the degree to which teachers apply ICT to teaching. Teachers in urban cities are more likely to use ICT tools such as Google Meet, Google Classroom, and Zoom to promote online learning (UNICEF, 2021). In contrast, teachers in remote areas tend to rely solely on WhatsApp groups to simply distribute teaching materials and collect homework (Focus Group Discussion with teachers in East Nusa Tenggara, 2022; Focus Group Discussion with P2G Teachers, 2022; Interview with the National Coordinator of

P2G, 2023). According to UNICEF (2021) research, teachers in rural areas such as Merauke in Papua and Central Palu have chosen not to integrate these platforms into their teaching practices due to a lack of familiarity with the technology and the content's relevance to their local settings⁹.

More generally, limited comprehension and awareness of ICT tools by teachers in rural areas is hindering the exploration of how ICT can improve educational outcomes (Muslem et al., 2018; UNICEF, 2020). For instance, rural teachers may not understand how to leverage platforms like WhatsApp beyond basic messaging for meaningful pedagogical purposes (Rizal et al., 2019; UNICEF, 2020). Similarly, low levels of technological skills create significant barriers to the integration of ICT into teaching and learning (Interview with the National Coordinator of P2G, 2023). Indeed, as already noted, WhatsApp may only be used to collect assignments, whilst its potential for fostering collaborative discussions and interactive learning remains unrealized. This discrepancy highlights a missed opportunity to engage with students on a deeper level and effectively convey the subject matter.

A World Bank (2020) assessment on teacher's pedagogical skills found that Indonesian teachers performed poorly, with an average score of 22 percent in MORA schools and 25 percent in MOECRT schools. Despite the need for pedagogical knowledge training, over 90% of training focuses on "use of media and technology", while only 62% of training covers subject-specific pedagogy (World Bank, 2022). As previously mentioned, training that focuses on developing basic operational skills for technology may be essential. However, effectively translating this ICT use in the classroom in a way that is appropriate, relevant to the subject being taught, and engaging for students also necessitates adequate pedagogical skills.

There is also significant reluctance amongst some teachers to adopt new technologies; predominantly observed amongst older teachers, those with insufficient ICT skills, and teachers who do not see ICT adoption within the education sector as an urgent issue (Focus Group Discussion with P2G & IGI, 2023).

This disparity highlights the need for targeted and inclusive training initiatives that address the specific challenges faced by teachers in rural areas and bridge the digital divide (UNICEF, 2020). In addition to ensuring the continuous flow of information and engagement, training materials should also improve subject-specific pedagogical elements. To address teachers' reluctance to adopt new technologies, appropriate behavioral and training strategies should be implemented to motivate teachers to independently acquire new digital skills (Kartika & Nurlambang, 2023).

In summary, the implications of limited access to ICT in education are concerning, as government programs and interventions may not effectively reach their intended audience (Mirfani, 2019). A re-evaluation of the present approach is necessary, along with the exploration of alternative strategies. Existing training methods emphasize technical competencies, neglecting the importance of teachers understanding the underlying importance of ICT adoption. It is critical that all parties understand that it is not solely about using advanced ICT tools, but rather empowering teachers to select and utilize suitable tools from the wide range available.

⁹ The term "local settings" refers to the specific context, conditions, and needs of Indonesia's rural areas. Factors such as limited access to reliable internet connectivity, inadequate infrastructure, cultural considerations, and the unique challenges faced by rural communities can all be found in these settings.

Policy Recommendations

Establishing a Strategic Education Roadmap

Despite the Indonesian government's declaration that the digitalization of education is a national priority, the plan to achieve this goal lacks clarity. Currently, the focus is on providing access to ICT hardware and educational platforms within schools, as well as developing digital learning platforms under *Merdeka Belajar*. However, optimizing ICT in education goes beyond merely supplying the equipment and software required for online learning. It is imperative that technical training is also offered to teachers in order to improve their capabilities.

To address this issue, a well-structured plan is crucial to align efforts, clarify objectives, and coordinate actions. The MOECRT must finalize its strategic roadmap for education, specifically focusing on ICT adoption. A comprehensive roadmap will help streamline and identify the scope and focus of policies, resulting in a more unified and targeted approach. Moreover, MORA should also develop its own tailored roadmap to address the unique challenges faced by religious schools under its jurisdiction. .

A universal goal to improve the quality of education for Indonesian children should be at the center of both programs, with assessments such as PISA evaluations assessed nationally without distinguishing between students in Madrasa, private schools, or public schools. Although each roadmap must address specific challenges, they should ultimately align cohesively, effectively leveraging ICT to enhance learning outcomes and promote digital literacy amongst students and educators. By doing so, the education sector can collectively work towards providing quality education for all students, regardless of their educational backgrounds.

A roadmap will also allow MOECRT and MORA to work within current infrastructural constraints, where responsibility for delivery falls under different ministries. The roadmap must provide clear guidance for local governments and schools to optimize ICT usage and understanding in the classroom, acknowledging infrastructural capacity, cultural diversity, pedagogical skills, and other location-specific contexts.

Malaysia's Education Blueprint 2013-2025 (Box 1) serves as an exemplary model, demonstrating a comprehensive approach to integrating ICT within the education sector. It presents clear action steps and detailed deliverables towards achieving its goals, whilst also specifying the roles of teachers and students in fulfilling the roadmap's objectives and the benefits. Incorporating ICT into educational frameworks equips students with essential digital skills and fosters familiarity with contemporary technologies.

Targeted Training for Teachers in Rural Areas Emphasizing Pedagogy Integration

To address Indonesian teachers' lack of ICT skills, training materials for teachers should go beyond the technical aspects of using specific ICT tools or media. They must also demonstrate practical ways for teachers to integrate ICT and pedagogy that support the curriculum. Training programs and other initiatives must address the reluctance of many teachers to adopt new technologies. It is essential to articulate to teachers the underlying reasons why digitizing education is of vital importance, and why, as a result, the government is actively promoting technology-based education going forward.

Acknowledging differences in skills and interest across Indonesia, the government and EdTech companies should employ localized approaches to motivate and encourage teachers to adopt new technologies. Demonstrating how to use technology in a way that is relevant to the teachers' specific cultural context and needs will better position them to adopt digital tools effectively.

By tailoring the training and learning platforms to align with rural teachers' daily practices and local values, an improved uptake by teachers is expected. With awareness and access to ICT, teachers in rural

and remote areas can then creatively leverage even the simplest ICT tools or platforms to enhance their teaching and learning processes in the classroom.

As with all good policy design, program evaluation is fundamental. As a result, a process of post-training evaluation should be put in place. Relying solely on the overall student learning outcomes in the *Rapor Pendidikan* does not offer specific insights to pinpoint the areas that need improvement and address them individually. Follow-up sessions and other methods of evaluation should be explored and developed.

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