GLOBAL EDUCATION MONITORING REPORT

2025

REGIONAL EDITION ON LEADERSHIP IN EDUCATION

East Asia

Lead for technology

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Sustainable Development Goals

Global Education Monitoring Report

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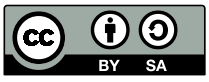

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The Education 2030 Incheon Declaration and Framework for Action specifies that the mandate of the *Global Education Monitoring Report* is to be 'the mechanism for monitoring and reporting on SDG 4 and on education in the other SDGs' with the responsibility to 'report on the implementation of national and international strategies to help hold all relevant partners to account for their commitments as part of the overall SDG follow-up and review'. It is prepared by an independent team hosted by UNESCO.

The *Global Education Monitoring Report* team is responsible for the choice and the presentation of the facts contained in this book and for the opinions expressed therein, which are not necessarily those of UNESCO nor of its funders and do not commit the Organization. Overall responsibility for the views and opinions expressed in the Report is taken by its Director.

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The Global Education Monitoring Report team

Director: Manos Antoninis

Daniel April, Marcela Barrios Rivera, Madeleine Barry, Yekaterina Baskakova, Meagan Brooks, Catarina Cerqueira, Aruem Cho, Anna Cristina D'Addio, Rafaela Maria Da Silva Santos, Dmitri Davydov, Francesca Endrizzi, Tuamanaia Foimapafisi, Pablo Fraser, Chiara Galasso, Lara Gil Benito, Pierre Gouëdard, Priyadarshani Joshi, Maria-Rafaela Kaldi, Akashdeep Kaur, Josephine Kiyenje, Jodi Klue, Camila Lima De Moraes, Kate Linkins, Kassiani Lythrangomitis, Aurélia Mazoyer, Anissa Mechtar, Claudine Mukizwa, Yuki Murakami, Judith Randrianatoavina, Kate Redman, Maria Rojnov, Amina Sabour, Divya Sharma, Laura Stipanovic, Aziah-Katiana Tan, Thomas Vienot, Dorothy Wang, Elsa Weill and Shifeng Zhou.

SHORT SUMMARY

How can education leaders in East Asia be supported to contribute to digital transformation?

The digital transformation of education requires leaders who can adapt and manage systemic changes in an environment of uncertainty. They are responsible for achieving ambitious digital reforms while balancing a growing list of related tasks, from guidelines to professional development and from strategic resource allocation and infrastructure maintenance to monitoring implementation.

This regional edition accompanies the 2024/5 *Global Education Monitoring Report* on leadership and follows the 2023 *Global Education Monitoring Report* on technology. It documents the links between the two themes in East Asia, where some of the boldest experiments in digital transformation are well underway, boosted by distance education during the pandemic and the surge of artificial intelligence. It demonstrates the central role of education leaders in advancing the digitalization of education in ways that are context specific and keep learners' interests at the core.

By 2030,
China aims to introduce AI education in all primary and secondary schools.

School principals are gatekeepers for digital transformation. Their significant role of forging safe and inclusive digital cultures in school communities is increasingly recognized in countries' digital strategies and plans.

Local education officials at the prefecture, municipal, country and district levels also play critical roles in overseeing digital education reforms, monitoring their implementation and submitting information for policy adaptation. Strong collaboration and communication between leadership tiers is essential to ensure that the shift to digital transformation is efficient, effective and equitable.

Drawing on the East Asian experience, this regional edition calls on countries to further recognize and support education leaders in any plans to roll out digital education reforms, fostered by effective selection processes, professional development and support measures. This should be recognized in plans, policies and guidelines to facilitate the smooth transition to the digital era in education.

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"Since wars begin in the minds of men and women, it is in the minds of men and women that the defenses of peace must be constructed"

Foreword

In an increasingly interconnected and technology-driven world, the imperative to harness the power of digital innovation for learning has never been more critical. Education, the cornerstone of sustainable development and social progress, must not only adapt to this new reality but actively lead its evolution. Until now, discussions on digital transformation have predominantly focused on technological infrastructure or content. This report, *East Asia: Lead for technology. Regional edition of the Global Education Monitoring Report 2024/5*, reminds us that the indispensable role of education leaders lies at the heart of this transformation at both local government and school level.

East Asia is a compelling case study for this commitment. The region is rapidly adopting artificial intelligence and advanced digital platforms to reshape learning experiences. It is pushing education systems towards a future where technology facilitates more personalized, collaborative and accessible learning. And education leaders' roles at the system and school level are evolving and adapting as a result.

School principals can no longer be seen as mere administrators. The arrival of advanced technologies is adding to their expanded responsibilities, which is reflected in the new digital strategies emerging from the region. Indeed, digital transformation is not just a technical shift, it is a cultural one, of which school leaders are at the helm. They need to be comfortable managing procurement and cybersecurity as well as pedagogical innovation, staff capacity and overseeing student well-being. Teacher leaders in the region are also emerging with the critical role of facilitators in this paradigm shift.

Empowering educational leaders with training is critical. Providing policy coherence, clear guidance, and sustained support must be provided for leaders at all levels. This report emphasizes the importance of a collaborative management culture, accompanied by robust guidelines and standards on technology.

Strategies may be designed centrally but reform succeeds when objectives are shared, and all actors are empowered to work towards them. This means that a distributed leadership model, where all leaders pull together for the transition, is essential. It ensures that digital transformation is not merely a top-down mandate but a deeply embedded practice that resonates throughout the learning ecosystem. Fostering collaboration, both between levels of governance and within institutions, will feed this system change.

By synthesizing the rich experiences of China, Japan and the Republic of Korea, this regional edition offers actionable insights and recommendations that can inform and inspire digital transformation efforts globally.

It is our collective responsibility to ensure that every child, everywhere, can thrive in an increasingly digital world. With strong, supported, and collaborative leadership, this future is within our reach.

Stefania Giannini
Assistant Director-General for Education, UNESCO

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COUNTRY CASE STUDIES

China
Ronghuai Huang, Jianhua Zhao, Jingwen Pan, Mohamed Oubibi and TingWen Chang
(Beijing Normal University)

Japan
Jun Kawaguchi and Yuta Yoneda

Republic of Korea
Eun Young Kim
(Korean Educational Development Institute)

THEMATIC PAPER

A framework on the relationship between system and school leadership with the implementation of digital transformation reforms in education
Junjun Chen

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KEY MESSAGES

Digital transformation in education is accelerating in East Asia.

- More than half of schools in China have independent digital management platforms. Japan brought its one-device-per-student target under the GIGA school programme forward from 2023 to 2020 because of the COVID-19 pandemic.
- The region is fast adopting artificial intelligence in education. The Republic of Korea is introducing AI-powered textbooks to be fully rolled out by 2028. China aims to introduce AI education in all primary and secondary schools by 2030.

The role of school leaders for digital transformation is gaining attention.

- School principals can facilitate the growth of a digital culture, organize staff capacity development and select resources based on school needs. Their responsibilities are becoming ever more complex, ranging from procurement to cybersecurity and from pedagogy to well-being.
- This is now being recognized in new digital strategies. In China, school principals are being designated as Chief Information Officers. In Japan, the 2023 education digital transformation strategy positions principals as key drivers of digital innovation.

Teacher leaders are being assigned new roles to support the digital transition in classrooms.

- In China, the White Paper on Smart Education 2025 aims to provide teachers with 'new roles and missions'.
- In Japan, key persons, such as 'GIGA Leaders' are driving digital innovation in schools.
- In the Republic of Korea, two to three leading teachers per school are appointed to develop school-specific implementation strategies.

Local, school and teacher leaders need policy coherence, guidance and support.

- Nationwide learning management and assessment systems are significant. China has integrated 32 provincial systems into a unique national Smart Education Platform, organized by education level and track.
- Guidelines and standards on technology are needed to ensure its safe and effective roll-out. Japan recently released guidelines on the use of generative AI in schools.
- Specialist staff are needed to support schools in the digital shift. In the Republic of Korea, digital tutors manage the maintenance of school technology infrastructure.

Leaders need to foster collaboration between levels of governance and within institutions.

- Informal working groups between school leaders help them share experiences. A survey of principals in China found that the preferred training format was peer exchange.
- Local education officers can facilitate collaboration. Qinghai Province in China built partnerships with its more digitally advanced Shanghai, Jiangsu and Zhejiang peers.
- Consultation helps shape future digital education policies that are fit for purpose. Japan and the Republic of Korea consulted teachers in developing their digital strategies.

Leader training programmes are needed to manage the digital transition.

- All three countries require new principals to receive training and have updated teacher competency frameworks to include the use of artificial intelligence.
- Training is also important for system leaders. China and the Republic of Korea have ICT preparation courses for future administrators. In Japan, a survey of 815 municipalities found that negotiation and coordination were critical skills for implementing digital strategies.

East Asia is arguably the region at the vanguard of digital technology development. China's Digital China initiative, Japan's Society 5.0 and the Republic of Korea's Digital New Deal emphasize the need to digitalize social sectors, including education (China State Council, 2023; Japan Cabinet Office, 2021; Republic of Korea Ministry of Science and ICT, 2024). With the rise of high-speed, high-volume data applications, education is increasingly expected to become 'smart' (Mukul and Büyüközkan, 2023).

Definitions of smart education vary (UNESCO IITE et al., 2022). Generally, they include pedagogical concepts such as differentiated instruction and collaborative learning, which by no means require – but whose application is greatly facilitated by – digital technology (Zhu et al., 2016). In the Republic of Korea, the Ministry of Education, Science and Technology in its 2011 strategy highlighted learner self-directedness, flexible adaptation to individual learner preferences, expanded learning resources, and the breaking of time and place boundaries as key aspects of smart learning (Kim et al., 2013).

East Asian countries have adopted ambitious digital transformation reforms in education, which reflect a shift in conceptualizing how to organize teaching and learning. Digital technology has been both a driver and an expected outcome of changes in education. China's 2018 Education Informatization Plan 2.0, Japan's 2018 GIGA School Programme and the 2025 Master Plan VII in the Republic of Korea are the most recent education technology strategies in a long process of system transformation through digital technology (Japan Ministry of Education, Culture, Sports, Science and Technology, 2018; Republic of Korea Ministry of Education, 2025; Wang, 2023).

As central governments develop digital transformation strategies, education leaders at the local government and school level are critical for their implementation. They can tackle complexity and uncertainty associated with digital transformation. Managing technology is a new task in a growing to-do list for school principals and for district and county education officers (**Box 1**). It comes on top of a gradual shift to take on instructional and support functions beyond the administrative tasks for which they may have originally been recruited (Thessin, 2019).

School and system leaders with strong digital competencies and progressive pedagogical mindsets are more effective in implementing technology integration, including prioritizing equitable access for underserved students. This highlights the need to shift from assessing generic leadership qualities to identifying and fostering a digital-oriented leadership orientation. Yet associated challenges, including the need to master and experiment with digital technology tools for teaching and for operations, have received insufficient attention.

In academic research, the issue has been approached from different angles (Chen, 2025). From anthropology and ethnography, digital transformation has been analysed through the lens of social practices and cultural change: how digitalization influences identity, community relationships and social development (Pink et al., 2016). From a psychological stance, digital transformation has a complex and context-dependent impact on how individuals are motivated to act (Orben and Przybylski, 2019). From a management perspective, leaders in digital transformation need competencies such as adaptability and strategic thinking (Cortellazzo et al., 2019). In terms of economics, organizations need to adapt their models to effectively capitalize on digital opportunities (Teece and Linden, 2017).

Many of these perspectives are related to individuals. But from a policy perspective, ensuring that the leaders have the knowledge, attitudes and behaviours to impact change is a systemic issue. This issue lies at the intersection of the last two *Global Education Monitoring Report* editions. The 2023 report, which focused on technology in education, called on policymakers to ask whether education technology investments improve learning, in other words, whether they are appropriate, equitable, scalable and sustainable. The 2024/5 report, which focused on leadership in education, called on education systems to trust their leaders and grant them autonomy; to invest in their professionalization, through the right selection, training and appraisal policies; to promote shared leadership and collaborative cultures; and to develop the capacity of education officials.

These concepts drive this regional edition on East Asia, which begins with a section that introduces the role of school and system leaders in digital transformation. It then moves to three sections on the experiences of China, Japan and the Republic of Korea. A final section compiles the evidence from the three case studies and offers recommendations.

BOX 1.

The regional editions of the 2024/5 Global Education Monitoring Report

The 2024/5 *Global Education Monitoring Report* focused on education leadership at the school, system and political levels and was entitled *Lead for learning*. However, apart from leaders' impact on measurable learning outcomes, which receives the most attention, leaders also contribute to many other important education outcomes.

For this reason, a series of regional editions explore selected outcomes that receive less attention: the development of an inclusive school ethos in Central and Eastern Europe, the Caucasus and Central Asia; democratic school management through the exercise of distributed leadership in Latin America; and, in this edition, digital transformation in education in East Asia. It is the result of a partnership of the *Global Education Monitoring Report* with Beijing Normal University, the Korean Educational Development Institute and Sophia University.

Three main pieces of evidence are used. First, three case studies analyse the experiences of China, Japan and the Republic of Korea. They explore how education leadership at the local government and school level is exercised in the implementation of digital transformation reforms. They also show how leaders are supported in this process. Second, country profiles on school leader standards, selection processes and training programmes were developed from these countries as part of the preparation for the Profiles Enhancing Education Reviews (PEER) website. Finally, a framework paper was prepared on education leadership and digital transformation.

School and system leaders have a major role in digital transformation in education

Digital transformation implies an organizational, pedagogical and cultural shift in teaching and learning (Petterson, 2021; Reis-Andersson, 2024), notably through personalization (Willermark et al., 2024). Artificial intelligence (AI) and advanced communication tools also enhance how education actors operate and interact (Chen and Kouhsari, 2025).

Digital transformation is initiated with the development of technology resources and infrastructure (Mukul and Büyüközkan, 2023; Qayyum, 2022). In 2018, more than 60% of 15-year-old students in countries and territories in East Asia that took part in the Programme for International Student Assessment (PISA) (admittedly not a representative sample of the region's population) were already in schools whose principals reported that there were enough connected digital devices and that the school's internet bandwidth was sufficient (OECD, 2020).

The digital transformation process accelerated during the COVID-19 pandemic and has been sustained. Education institutions restructured or tested existing organizational practices to ensure the continuity of education outside school. In Japan, for example, over 70% of schools reported in 2024 that they used information and communication technology (ICT) for remote learning in case of need. Nearly 90% of students use technology to quickly find information, better understand lessons through multimedia, and share ideas with peers (Japan National Institute for Educational Policy Research, 2024).

The role of principals and teachers is recognized in country strategies. The Republic of Korea's 2023 Digital Education White Paper acknowledges the role of each education actor in the digital education system (Republic of Korea Ministry of Education and KERIS, 2023). China's 2025 White Paper on smart education envisions new roles and missions of teachers through AI (China Ministry of Education, 2025b). Japan's Basic Plan for the Promotion of Education states that it is important 'for educational administrators, teachers, and other actors … to share the vision of ICT and data utilization and to create new educational value through digital technology' (Japan Ministry of Education, Culture, Sports, Science and Technology, 2023, p. 28).

In their respective roles, school and system leaders share responsibilities for driving digital transformation (**Table 1**). They can help schools adapt to evolving technological advancements (Witthöft et al., 2025); guide the effective integration of digital tools into teaching and management and evaluate its outcomes (Chen, 2025); maintain and extract the full potential of digital infrastructure (McCarthy et al., 2023), especially as rural schools often report that one-time investments in digital equipment are not properly maintained (Luo, 2024); address disparities in access to digital tools (Boeskens and Meyer, 2025); and protect teachers and learners from risks to privacy, safety and well-being.

School principals are gatekeepers for digital transformation. Their decisions and actions influence schools' pathways (Witthöft et al., 2025). Committing to clear school development goals, exercising good leadership practices and integrating technology tend to be interrelated, but understanding the links between them merits closer analysis. School principals must balance the needs, motivation and expectations of teachers, students, families and the school community. School leaders can facilitate a digital culture through authority or bureaucratic influence, but also through an ability to engage teachers to integrate digital resources into their pedagogical models to improve learning, ensuring that curricula and pedagogies are adapted to improve learning.

System leaders are local education officials whose job is to support schools (Thessin, 2019). They are responsible for the implementation and follow-up of central government initiatives and reforms aimed at digitally transforming the education system. They are required to play multiple roles: to understand the objectives of the reform; to take initiative in identifying schools and leaders that will champion the reform and serve as an example to others; and to provide feedback to central authorities on how the reform is progressing and what finetuning is required to overcome obstacles, adapt policies and redistribute resources based on needs.

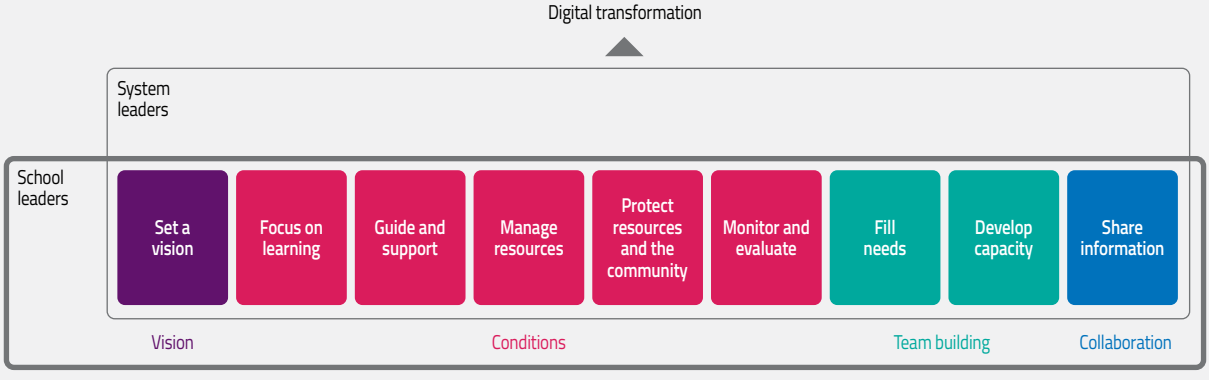
Those working in education depend on each other. Leadership functions need to be shared to achieve education goals, such as digital transformation (**Figure 1**). School and system leaders in different roles and with varying areas of expertise engage in leadership practices both independently and collaboratively. The distribution of leadership shifts the focus from leadership carried out by individuals in designated roles to a broader organizational perspective to improve four core processes: to provide and communicate a vision for change; to manage resources to improve learning; to develop teams; and to encourage collaborative action (Ng and Ho, 2012).

TABLE 1.
School and system leaders' functions and practices in digital transformation

Function	Practices
Establish a vision for digital transformation	
Set a vision	Develop and communicate a clear and inclusive vision on digital transformation Align the vision with the local and school context
Create conditions for digital transformation	
Focus on learning	Implement central government digital transformation reform guidelines Align resource allocation with strategy goals and needs to improve learning
Guide and support	Provide supportive tools for the use of technology Provide instructional resources and materials on the use of technology
Manage resources	Ensure an efficient and sustainable set-up and maintenance of digital infrastructure Ensure equitable access to and use of digital resources
Monitor and evaluate	Set and monitor digital transformation objectives inclusively Provide support when results are not met
Protect infrastructure and school community	Protect school digital infrastructure from cybersecurity threats Protect teachers and students on issues related to privacy, safety and well-being
Professionalize actors for digital transformation	
Fill capacity needs	Select teachers who can support the effective use of technology in classrooms Select support staff who can support the school community in the use of technology
Develop capacity	Provide professional opportunities on digital technology Assess teachers and reward effective use of technology
Foster collaboration for digital transformation	
Help information flow	Encourage communication within, between and beyond schools Create inclusive and collaborative processes and build networks

Source: GEM Report team, based on Chen (2025) and Leithwood et al. (2020).

FIGURE 1.
School and system leaders contribute to digital transformation through their actions



Source: GEM Report team.

China

In China, the governance structure for digital education is hierarchical, coordinated by the central government. Provincial governments (first level) tailor central policies to the local context, resulting in provincial plans. Prefecture (second level) and county/district (third level) governments are responsible for implementation. Provincial and county education departments are responsible for the procurement, maintenance and updating of digital resources. Schools collaborate and share resources through formal partnerships ('education collectives'). In 2021, two in three schools in the country had formulated informatization development plans (Qu and Gao, 2022).

Until 2000, the initial focus of national policy frameworks to digitalize education was on computer-based laboratories for computer education in schools and on computer-assisted instruction (Huang, 2025). From 2001 onwards, the focus shifted to expanding education technology on a national scale, strengthening physical digital infrastructure and supporting equipment, and integrating ICT in the curriculum (Li and Li, 2017), especially with the Education Informatization Plan 1.0 in 2012. By the end of 2017, the first iteration of a national programme to develop ICT competencies trained 10 million educators on ICT integration in education (Xinhua News Agency, 2019).

In 2018, the Education Informatization Plan 2.0 shifted the focus from quantitative expansion to qualitative improvement. School principals were given the title and responsibility of Chief Information Officers. The second iteration of the national programme to develop teacher ICT competencies is based on localized plans. It mandates ICT training in professional development. Next, the 2022 National Strategy for Digital Education and China's Education Modernization 2035 Plan launched in 2025 focus on a smart education ecosystem. The Planning Outline for Building an Education Power (2024–2035) calls for using education digitalization to open new development pathways and shape new competitive advantages (China Government, 2025).

The Smart Education Platform, which hosts 32 provincial-level platforms, provides access to and allows sharing of a national library of digital learning resources. Resources are organized by school level, grade and subject. In Guangxi Zhuang Autonomous Region, for example, digital textbooks and supporting resources cover 83% of the main subjects (Zhou, 2024). Since 2022, several provinces have begun to pilot the national platform in schools. For example, Qinghai Province adapted the national platform to local needs to ensure that digital content meets the diverse linguistic and cultural requirements of its multi-ethnic population. Du'an Yao Autonomous County, Guangxi, used the national platform in all primary and secondary schools, while 97% of teachers accessed the digital education platform weekly (Zhou, 2024). In 2025, the AI Proving Grounds were added to the Smart Education Platform, where teachers and students can use AI tools to support their teaching and learning (**Box 2**) (Zhang, 2025).

BOX 2.

Education leaders in China are called on to integrate artificial intelligence in education

China aims to introduce AI education in all primary and secondary schools by 2030 (Yan and Liu, 2025). In 2024, the Ministry of Education announced a list of 184 primary and secondary schools selected as AI education bases for the implementation of AI education (Xu, 2024). Several national policy documents have encouraged school leaders to use AI-supported education (Yuan, 2024).

In 2021, 38% of principals reported that their schools carried out AI-assisted teaching activities, while 83% of principals were willing to continue exploring and promoting the application of AI technology in education management and more than half were already utilizing or preparing to utilize AI in teaching and learning (Zhang and Zhang, 2022). Some schools have integrated AI-powered virtual teaching assistants, allowing students to ask questions to historical figures. Others have created robotics courses which teach students about AI (Yan and Liu, 2025).

The Guide to Artificial Intelligence General Education in Primary and Secondary Schools, released in 2025, outlines AI use in various levels and aspects of education (China Ministry of Education, 2025a). The guide encourages teachers to customize learning, conduct evaluations and promote collaboration with parents (China Ministry of Education, 2025a). For lower-level primary students, the emphasis is on perceiving and experiencing AI technologies, while for those in higher grade levels, the focus is on understanding and applying AI technologies. Senior high school students experiment with developing AI projects and explore advanced AI applications (Xu, 2024).

Continued on the next page

BOX 1. *Continued*

The use of AI and online learning platforms brings ethical issues to education governance. Current education technologies being trialled in Chinese schools collect vast amounts of data derived from the behaviour of students using cameras and facial recognition software (Yuan, 2024). The Opinions on Strengthening the Governance of Science and Technology Ethics clearly state that leading cadres at all levels and relevant responsible entities should enhance their awareness of science and technology ethics and consciously comply with ethical norms and related requirements (Xinhua News Agency, 2022). The Ministry of Education's AI Empowerment Education Initiative outlines four specific actions related to the integration of AI in education, including ethics for leaders (Lin, 2024).

The Guidelines for the Use of Generative Artificial Intelligence in Primary and Secondary Schools discuss safeguards to ensure the safe and compliant use of data and the protection of the rights and interests of teachers and students (China Ministry of Education, 2025a). Education leaders must be able to continually reflect on such key areas and strengthen their own media literacy education so they can advocate for their teachers and students (X. Yang et al., 2023).

China has also tried to expand the implementation of these strategies and plans in two ways. First, it has targeted rural areas designated for poverty alleviation efforts ('Three Regions and Three Prefectures'), to ensure that they catch up in terms of school internet connectivity, ICT equipment and mobile phones for digital education resources and learning apps, and teacher and school principal training. Second, it has invested in showing the effects of Smart Education Demonstration Zones (**Box 3**).

BOX 3.

In China, Smart Education Demonstration Zones have been a vehicle for innovation

Since 2018, the Ministry of Education has designated 18 zones to serve as leading models and learning centres for the implementation of national policies to promote digital transformation objectives in education. These zones have received policy guidance suited to their local characteristics and needs through expert teams, preferential resource support and additional funds for projects (Zhang et al., 2025).

Each Smart Education Demonstration Zone has followed its own area of emphasis. Some zones focused on infrastructure. For example, Minhang District, Shanghai, has strengthened its digital education infrastructure and smart learning environments to develop an integrated service system that combines industry, academia and research (F. Wang et al., 2023). Haidian District, Beijing, also upgraded school hardware and software, with an emphasis on developing an intelligent security system, electronic class boards, an outdoor reading kiosk, a streaming media centre and a school-based resource platform.

Other zones have focused on governance. For example, Wuhou District, Chengdu, focused on intensive data use. Data hubs were built in 15 schools and connected to application databases, which provided a visual early warning monitoring mechanism for key objectives (Y. Wang et al., 2023). Ouhai District, Wenzhou, piloted a digital student growth evaluation system that covered all students, which then expanded to other locations in the city (Hou and Ma., 2023). Several zones, including Shenzhen, have used the 'digital portrait' concept to understand student profiles and develop personalized learning programmes (UNESCO IITE, 2021).

These zones are among the most privileged in the country, but their experience is meant to trickle down to disadvantaged areas, a process with which some of these zones are already experimenting. Haidian District developed an online direct-broadcast teaching system to provide high-quality resources for disadvantaged schools (F. Wang et al., 2023). Yunnan Province has begun using 5G technology to pair urban and rural schools for synchronous classroom instruction (Yin, 2025b).

STANDARDS AND PROGRAMMES AIM TO DEVELOP SCHOOL PRINCIPALS' CAPACITY

According to national standards developed in 2013, school principals are expected to have 'mastery of the general principles and methods of applying information technology in the field of education' (China Ministry of Education, 2013). In 2014, the Ministry of Education released the first Educational Information Leadership Standards for Principals of Primary and Secondary Schools. The standards consist of six leadership requirements that can be applied to education technology: leading development; collaborative innovation; improving information literacy; planning and design; organization and implementation; and evaluation and promotion.

The Ministry updated the standards in 2022 and organized the team focusing on strategic research to continue carrying out digital literacy assessments (Yin, 2025a). In July 2025, the Ministry of Education issued the Notice on Organizing the Implementation of the Action Plan for Empowering Teacher Development through Digitalization, proposing the establishment of strategic research teams and the formulation of digital competency standards for primary and secondary school principals (China Ministry of Education, 2025b).

The Ministry of Education is working on a plan whereby schools would be responsible for establishing data standards, creating data resource catalogues and developing data sets on teachers, students, teaching and research. School principals should have data planning, management, and execution skills. More than half of schools in China have established their own digital management platform (X. Yang et al., 2023). Yet progress is often held back when school principals are reassigned or their focus shifts (Huang and Hu, 2012).

Moreover, research shows that principals tend to focus on monitoring and evaluation rather than on using data to promote teaching and learning improvements (Qu and Gao, 2022). In order to be skilled data leaders, school principals need to be competent not only in the collection, classification, processing and management of data but also in finding complex correlations and causal relationships. Principals need to also be able to support their staff to use the data to analyse students' learning and development processes, especially relevant to their family situation (X. Yang et al., 2023). Principals with high digital self-efficacy have positively impacted digital transformation in schools, while principals with digital anxiety have negatively impacted it (Chen and Kouhsari, 2025).

At the central level, there are two main programmes. First, the Ministry of Education organizes nationwide training workshops on educational informatization for Education Bureau Directors who are the heads of provincial education departments. From 2018 to 2024, a total of 32 sessions of specialized training on digital leadership were held, involving more than 4,000 directors of education bureaus. Second, it runs the ICT Leadership Training Programme for Primary and Secondary School Principals, which has reached over 60 of the 339 prefectures with an emphasis on remote and ethnic minority areas. More than 10,000 principals were trained, covering 5,339 schools (Tian et al., 2020).

At the provincial and county level, local education departments organize professional technical teams consisting of IT experts, educators and technical support staff to provide ongoing guidance to school principals. Examples include the Inner Mongolia Autonomous Region, which launched its own IT Application Ability Improvement Project in primary and secondary education (Bian et al., 2016), and Xinjiang Province, which trained all subject teachers and school leaders in digital education skills (Liu, 2025). In Minhang District, Shanghai, school principals attended training sessions featuring modules on AI, informatization planning and management, security, technology integration in classrooms, data-driven student and teacher development, and project research.

While the 2011–2020 10-Year Development Plan for Educational Informatization called for principals' informatization leadership to be evaluated annually, many administrators believe that principals should not all be held to the same standards (e.g. that special accommodations should be made for older principals), a fact that had largely reduced assessments to a mere formality (Bian et al., 2016). Indeed, school principal preparedness varies, which partly reflects provinces' and districts' different priorities. In 2021, a national survey of principals in training found that just 14% used technology in the daily management of teachers and students (Qu and Gao, 2022). In Hunan Province, a study found a low level of technology leadership preparedness among principals (Wang, 2022).

School leaders can compensate for school weaknesses in the implementation of digital education reforms in various ways. First, they can appoint specialized ICT coordinators or digital specialists to oversee the adoption, management and training for the use of digital tools. A district in Hubei Province reported that 92% of its schools had dedicated staff for informatization, although 48% only had one person, often just the IT teacher or the principal (Zhu, 2016). In rural areas, few schools have dedicated ICT personnel and, of those who do, most are temporary

part-time teachers with minimum ICT knowledge (Guo, 2024).

Second, they can cooperate with universities, research institutes and businesses. Many utilize networked communities for virtual training and learning to carry out professional improvement learning activities (Dai et al., 2023). In Hubei Province, a teaching community fosters collaboration and exchange between universities, local education authorities, primary and secondary schools, and companies specializing in virtual teaching platforms.

Third, principals can learn about ICT management through sharing knowledge with peers (H. Li and Li, 2017). A national survey of principals found that the most preferred training format for leadership in digital education was interactive exchanges with other principals (Bian et al., 2016). Another survey found that 95% of principals had frequently interacted with their peers, even if they did not frequently contact external IT experts (Zhu, 2015). Qinghai Province established master teacher and principal communities to help bring together expert mentors for collaboration.

One of the areas in which such collaboration is necessary is the protection of student privacy and security for which school leaders are responsible (Lin et al., 2023). A survey found that 70% of principals agreed that network management and information security were important (Zhang and Zhang, 2022). Principals need to take steps to protect school networks through cybersecurity software and the regular maintenance and update of network infrastructure. They can also implement cybersecurity education in schools so that students can protect themselves and prevent online threats. As part of the National Educational Digitalization Strategy, the government has taken steps to add protection features to personal learning devices in primary and secondary schools, create a unified national identity authentication system, and ensure that students can access the internet safely and responsibly.

Japan

Japan's vision for the digital transformation of its education system is grounded in creating equitable, personalized and future-ready learning environments. This vision has evolved alongside shifts in political leadership and governance structures, from centralized control to a more distributed model that increasingly values autonomy and innovation.

Japan's commitment to digitalization began with the e-Japan Strategy and the IT Basic Law in 2000, which positioned ICT as a national development imperative (Japan Cabinet Secretariat, 2001). In 2010, pilot initiatives in 10 elementary schools led by the Ministry of Internal Affairs and Communications and the Ministry of Education, Culture, Sports, Science and Technology (MEXT) began testing school digitalization models as part of the Future School Promotion Project in the Vision for ICT in Education (Japan Ministry of Education, Culture, Sports, Science and Technology, 2011; The Economic Times, 2010). While this vision recognized teachers as key actors for classroom-level implementation, school principals were notably absent from the leadership structure. Strategic and operational responsibilities were retained at the national and prefecture levels (Japan Ministry of Education, Culture, Sports, Science and Technology, 2011). These efforts were short-lived, however, as the pilot projects were discontinued (Matsumoto, 2022).

In 2013, Japan's Declaration to be the World's Most Advanced IT Nation marked a renewed push for systemic digitalization, including in education. Leadership remained heavily top-down, with central government entities responsible for infrastructure development, legal reform and funding mechanisms. Teachers were framed primarily as implementers of national initiatives, mainly through structured training for ICT integration, while school principals again received little policy attention (Japan Government, 2013).

In 2019, the launch of the Global and Innovation Gateway for All (GIGA) School Programme signalled a meaningful shift toward a more integrated and multilevel governance model. Designed to address disparities in ICT access, the programme aimed to provide high-speed internet connectivity in all schools and guarantee one digital device per student on a five-year lease by 2023. While centrally coordinated by MEXT, the programme emphasized flexible, context-specific implementation led by local Boards of Education at the prefecture and municipality level. The programme also marked a turning point in the recognition of school-level leadership and empowering teachers to adapt and innovate digital practices through structured support and training (Japan Ministry of Education, Culture, Sports, Science and Technology, 2019a). The COVID-19 pandemic pushed the system towards deeper pedagogical digitalization and structural transformation. Faced with limited online learning capacity, as only 5% of local governments could initially support real-time remote instruction, a supplementary budget was introduced to fast-track the GIGA programme, advancing the goal of one device per student to the end of 2020 (Japan Ministry of Education, Culture, Sports, Science and Technology, 2020a, 2020b).

THE ROLE OF SYSTEM AND SCHOOL LEADERS IN DIGITAL TRANSFORMATION IS GROWING

Aligned with the principles of Society 5.0, the Japanese government's blueprint for growth, MEXT's long-term vision emphasizes inclusive, learner-centred digital environments that cultivate autonomy, digital fluency and lifelong learning capacities, supported by a multitiered governance and leadership model (Japan Cabinet Office, 2021; Japan Ministry of Education, Culture, Sports, Science and Technology, 2023).

While MEXT is responsible for establishing the national curriculum, issuing digital policy guidelines and funding local digital education initiatives, operational control over digital transformation in education lies with Japan's 47 prefectures and 1,718 municipalities, including the 23 special wards of Tokyo (OECD, 2023a). Municipalities – for primary and lower secondary education – and prefectures – for upper secondary education – are to develop plans for promoting ICT utilization in education, based on national policy goals but adapted to reflect local conditions, including infrastructure, demography and fiscal capacity (Japan Government, 2019).

This decentralized model confers extensive autonomy on local governments for procuring and managing core digital systems, including student information and learning management systems. Despite this autonomy, local governments commonly opt into national initiatives, such as GIGA and the computer-based testing system (MEXCBT). While voluntary, these programmes act as soft policy levers which encourage alignment with national standards for interoperability and equity (OECD, 2023a).

School leaders hold practical authority over the selection and use of digital teaching and learning resources. A significant exception is textbooks, both paper and digital, which are approved by MEXT through a national catalogue. Local education leaders choose from this list for public primary and secondary schools, while private school principals usually make these decisions independently. MEXT data show the rapid increase in the use of digital

resources, with the share of public schools using at least one digital textbook rising from 8% in 2020 to 88% in 2024 (Japan Ministry of Education, Culture, Sports, Science and Technology, 2024f; OECD, 2023a).

Within this framework, school principals adopt and implement digital technologies strategically, according to the principle of 'Pedagogy First, Technology Second'. Effective school principals assess student needs (e.g. remote learning for chronically absent students) and select appropriate technologies (e.g. using platforms like MEXCBT for delivering assessments and exercises).

The government enacted the Law Concerning the Promotion of Informatization of School Education in 2019 (Japan Government, 2019), followed by a Plan for Promoting ICT Utilization in School Education in 2022 and a Roadmap for the Utilization of Education Data. These were in response to teachers' high level of workload, as they reported the longest working hours among 49 education systems from high- and upper-middle-income countries that took part in the 2018 Teaching and Learning International Survey (TALIS), largely due to administrative burdens, such as recording attendance and handing out school forms (OECD, 2019). The plan and roadmap emphasize the need for school principals to exercise leadership, for teachers to enhance their professional capacity with ICT so they can move beyond the passive use of digital tools and improve their instructional practices, and for students to become autonomous learners (Japan Government, 2022; Japan Ministry of Education, Culture, Sports, Science and Technology, 2023). New leadership roles have been established to support schools and advance their digital transformation (**Table 2**).

The introduction of these roles has significantly advanced the integration of ICT in schools. A 2020 survey of 671 municipalities by MEXT had shown that the presence of ICT support staff increased teachers' opportunities and skills for using ICT in their teaching. When ICT support staff provided administrative support, they reduced teacher workload, enabling them to focus more on instruction.

TABLE 2.
Institutional mechanisms supporting educational digital transformation

Role	Purpose	Responsibilities	Employment	Target coverage
School DX strategy advisors	Guide digital transformation strategy in Boards of Education and schools	Offer comprehensive consultations, strategic guidance for digital reform	Nationally listed professionals (159 as of October 2024)	No specific ratio
GIGA school supporters	Support the development and maintain ICT environments in schools	Assist with ICT infrastructure set-up, device management and c ICT manuals or school-level guidelines	Hired by local Boards of Education with national subsidies	Varies by municipality, demand-based deployment
ICT support staff	Support the integration of ICT into classroom teaching and school operations	Support teachers with classroom ICT use, train staff, manage systems and assist with administrative tasks	Employed or contracted by municipalities	Target: 1 in 4 schools Actual (2023): 1 per 4.5 schools

Source: Kawaguchi and Yoneda (2025).

DIGITAL SKILLS HAVE BEEN ADDED TO RECRUITMENT CRITERIA AND TRAINING FOR EDUCATION LEADERS

Recruitment processes have traditionally focused more on administrative experience than on digital aptitude. Recognizing this misalignment with evolving needs, Japan has been adapting its recruitment processes for local government officials, school principals and teachers.

Superintendents of education are appointed by the head of the local government with the consent of the assembly based on eligibility criteria such as a moral character and good insights into educational administration (Japan Government, 1954). While traditionally drawn from former principals or mid-level administrators, recent policy recommendations have broadened both the expectations and recruitment criteria. There is now an emphasis on recruiting external personnel, including former teachers, administrative staff and private sector professionals, particularly in municipalities facing staffing shortages (Japan Ministry of Education, Culture, Sports, Science and Technology, 2024b). Leadership in digital transformation is also a key competency sought in current superintendent appointments (Japan Government, 2025).

To integrate digital transformation into public administration, Japan has implemented structured training programmes targeting key actors in local governance. For example, supervisors of boards of education, particularly those at the primary and lower secondary levels, are offered tiered training that begins with data interpretation and progresses to the application of tools such as Microsoft Power BI and Excel for data visualization (Japan National Institute for Educational Policy Research, 2025a). Similarly, the Japan Intercultural Academy of Municipalities provides specialized training for smaller local governments, emphasizing practical problem-solving, case studies and strategic planning (Japan Intercultural Academy of Municipalities, 2020).

A survey of 815 municipalities found that digital transformation depends not only on technical recruitment but also on cultivating soft skills, such as negotiation and interdepartmental coordination. These competencies are critical for embedding digital strategies within the broader framework of municipal governance (Nakagawa, 2025). Superintendents identified as 'Promoting Innovative Lesson' leaders because of their high ICT literacy and transformative education vision, have been particularly effective. Their approach includes deploying ICT support staff in schools and establishing district-wide platforms for collaboration, thereby institutionalizing innovation.

National policy has also encouraged standardized and scaled-up efforts. The Ministry of Economy, Trade and Industry (METI) has developed a Digital Skill Standards framework outlining five key roles for personnel responsible for digital transformation. In partnership with the Japan Deep Learning Association and other organizations, METI is introducing targeted assessments, such as a generative AI literacy exam, to ensure that local governments have the capacity to implement advanced digital solutions (Japan Ministry of Economy, Trade and Industry, 2023).

Teacher licensure requires completion of a MEXT-accredited training programme, governed by the Educational Personnel Certification Act. Amendments to the Act and its regulations have aligned teacher preparation with shifting educational demands, incorporating content on digital pedagogy. A 2021 regulatory revision further institutionalized digital literacy by introducing education theory and methods of using ICT as a core training component (Japan Ministry of Education, Culture, Sports, Science and Technology, 2021).

Policy efforts have also targeted the rigid licensure pipeline. In response to concerns that skilled private sector professionals are underutilized, it was recommended to reinstate the High School Teacher's Licence Examination to the subject 'Information', suspended since 2004, and broaden its scope to include a first-class licence in IT. In 2024, MEXT launched the revised examination, allowing recognition of national-level IT certification, to diversify evidence of subject-matter expertise (Japan Ministry of Education, Culture, Sports, Science and Technology, 2024a). Local appointing authorities are now legally required to establish systematic evaluation frameworks for both principals and teachers. These frameworks include indicators of digital proficiency and use of education data, and mandate annual professional development plans informed by training records (Japan Ministry of Education, Culture, Sports, Science and Technology, 2025c).

School principals have access to tailored professional development through webinars, regional workshops and self-paced modules on the national training portal, covering topics like cloud-based school management, the use of digital assessment tools, and strategies for leading ICT integration. These initiatives are part of the GIGA programme and MEXT's education digital transformation strategy, positioning principals as key drivers of digital innovation in schools (Japan Ministry of Education, Culture, Sports, Science and Technology, 2023). To accelerate this shift, MEXT has also launched a hybrid induction programme for new principals, blending online video lectures, collaborative forums and in-person

workshops. The training emphasizes institutional management, digital tool adoption and administrative innovation. Pilot results were notably strong with 98% of participants finding the content useful (Hatayama, 2025; Japan Ministry of Education, Culture, Sports, Science and Technology, 2024e, 2025d). Considering that principals are mostly drawn from the ranks of teachers, a range of training opportunities targeted at teachers has also been introduced (**Box 4**).

BOX 4.

In Japan, various training courses target teachers, who are the future school principals

In Japan, the National Institute for School Teacher and Staff Development offers ICT leadership training and provides online instructional videos for in-school use. According to the 2022 Policy on Utilization of School ICT Environment, each Board of Education and school is required to provide training on teaching methods that utilize ICT, including learning activities based on the new courses of study and learning activities that use ICT daily (Japan Ministry of Education, Culture, Sports, Science and Technology, 2022a).

Nevertheless, there is currently no formal obligation for teachers to develop digital competencies. This may help explain findings from a 2021 survey indicating that some 30% of teachers lacked confidence in using ICT in the classroom, while nearly 15% did not engage with digital tools for lesson planning, resource development, assessments or administrative tasks (Japan Ministry of Education, Culture, Sports, Science and Technology, 2022b). MEXT has issued a Handbook on the Digitalization of Education that offers pedagogical guidance on the effective use of digital technology in teaching (Japan Ministry of Education, Culture, Sports, Science and Technology, 2019b, 2020c). The GIGA StuDX Style platform disseminates cross-curricular best practices to providing educators with practical, scalable strategies for ICT-enhanced instruction (Japan Ministry of Education, Culture, Sports, Science and Technology, 2025e).

A 2023 international survey that included 87 Japanese school teachers found that higher levels of AI self-efficacy and conceptual understanding correlated with greater trust in education AI tools (Viberg et al., 2023). In response to the growing relevance of AI, Japan has issued national guidelines, which position teachers as active mediators who apply AI to streamline administrative tasks, enrich instruction, and uphold pedagogical and ethical standards (Japan Ministry of Education, Culture, Sports, Science and Technology, 2024d). Nonetheless, implementation challenges persist. A 2023 survey of over 100 secondary school teachers reported that 39% had never encountered the official guidelines on generative AI (Mina, 2023). A 2024 MEXT report found that some 40% of local governments had neither developed their own AI guidelines nor indicated an intention to follow national ones. Most municipalities reported no budget allocations for implementing generative AI, and expressed limited willingness to actively utilize such tools (Japan Ministry of Education, Culture, Sports, Science and Technology, 2024c). Moreover, a 2022 survey revealed that 58% of teachers felt unprepared to teach AI-related content. To bridge such gaps, the government launched the AI Education Accelerator Programme, aiming to train 50,000 teachers by 2025 through collaborations with private sector partners (Burton, 2025).

An important element of national policy in Japan has been to foster collaboration between and within different operational levels, grounded in shared terminology, governance structures and synchronized policy cycles. The 2019 Law Concerning the Promotion of Informatization of School Education formalized this integrated governance model. It mandates the establishment of the School Education Informatization Promotion Council, charged with ensuring interministerial collaboration between key government agencies, including MEXT, METI and the Ministry of Internal Affairs. An expert advisory panel is also mandated, embedding domain expertise directly into policymaking processes to improve strategic coherence across jurisdictions (Japan Government, 2019). As a result, MEXT has established multiple expert committees which bring together leaders from academia, schools and local governments (**Table 3**).

TABLE 3.
Composition of selected expert committees promoting digital transformation

Committee	Members
Experts' Conference on the Development of ICT Environments in Schools	Chief Supervisor of Education Board, ICT Director, Lower/Upper Secondary School Principal, University Professors
Review Committee on the Use of Generative AI in Primary and Secondary Education	Professors, Primary School Teacher, Non-Profit Organization Director, Education Board Superintendent, Former Superintendent
Expert Meeting on the Digitalization of School Affairs under the GIGA Initiative	Education Board Supervisor/Chief, Public Relations Director, Technical Advisor, Professors, Principals, Educational Researcher, Consultant, General Association Director
Review Committee on Revision of Teacher ICT Use Instruction Ability	Primary School Principal, Professors

Source: Japan Ministry of Education, Culture, Sports, Science and Technology (2025a).

Although MEXT does not have a fully developed research agenda on digital education, its affiliate, the National Institute for Educational Policy Research, established the Education Data Science Centre in 2021 to support data-driven insights in advancing the digitalization of education (Japan National Institute for Educational Policy Research, 2025b). Meanwhile, the National Institute for School Teachers and Staff Development plays a key role in translating research into practice by using evidence in professional development and hosting dialogues to promote innovative teaching (Japan National Institute for School Teachers and Staff Development, 2025).

Within schools, digital transformation is led by a deliberate culture of distributed leadership (Sato et al., 2021; Sato and Uchiyama, 2023). Principals initiate and support collaborative professional learning, particularly through in-house training based on lesson study that incorporates ICT integration. A critical node in this structure is the appointment of a person in charge of promoting ICT, teachers designated as digital innovation champions, who lead workshops, mentor peers and serve as catalysts for digital technology adoption. They disseminate practices and anchor school transformation efforts in localized, teacher-driven initiatives. Collaboration between teachers, researchers and developers is key to sustaining data-driven innovations such as learning dashboards and AI-supported feedback tools (Ogata et al., 2024).

Leadership extends beyond the individual school through well-structured interinstitutional and vertical coordination mechanisms. Boards of Education have institutionalized regular review processes, such as meetings to promote ICT and cross-school forums, where school leaders exchange insights, monitor progress and harmonize implementation efforts. Joint training and digital newsletters serve as horizontal diffusion channels, supporting system-wide policy coherence and peer learning.

External engagement is another defining feature of this collaborative approach. The Roadmap for Utilization of Education Data aims to turn parents and school communities into key stakeholders by enabling access to real-time data, encouraging active parental support and fostering cooperation among schools through ICT (Japan Government, 2022). Collaborations with universities, private sector actors and community groups are intentionally leveraged to diversify expertise and build digital capacity. For instance, a ward in Tokyo partners with ICT professionals for advanced technical training, while regional initiatives like Kagawa's DX Lab facilitate innovation that targets local education challenges. These collaborative ecosystems help schools access cutting-edge knowledge, test scalable solutions and foster a broader sense of shared responsibility for digital outcomes.

Republic of Korea

In the Republic of Korea, digital transformation has been outlined in five-year master plans. The first three (1996–2010) established digital administrative systems and expanded computer-based classroom learning. The fourth (2011–2014) emphasized student-centred digital learning and introduced digital textbooks and cloud-based smart education platforms. The fifth (2014–2018) further integrated ICT into the curriculum by strengthening teacher capacity. School leadership gained greater attention during the COVID-19 pandemic.

The sixth master plan (2019–2023) emphasized the need for remote and personalized learning along with teacher capacity-building programmes. Schools contributed to shaping the direction of technology in education (Republic of Korea Ministry of Education, 2020), while principals gained the authority to introduce technology-related courses at schools (Republic of Korea Ministry of Education, 2022b). Under the current seventh master plan (2024–2028), teachers are expected to lead classroom innovation and enhance digital and pedagogical skills to support personalized learning through digital textbooks (Republic of Korea Ministry of Education, 2025). Training on digital technology is designed to strengthen principals' roles (Jang et al., 2024).

With the enactment of the Local Autonomy Act in 1991, the Republic of Korea has decentralized some authority to the 17 Metropolitan and Provincial Offices of Education (Han, 2019). Headed by superintendents, local offices of education share responsibility with the Ministry of Education for digital infrastructure, local school management and financial support to digital systems (Republic of Korea Ministry of Education, 2023b; OECD, 2023a). They allocate funds to schools and procure digital services and products. The Korea Education and Research Information Service (KERIS) is responsible for regulating and providing digital tools and resources through the centralized EduNet T-Clear platform (OECD, 2023a). Device leasing and joint procurement are also common practices to minimize regional disparities (Republic of Korea Ministry of Education, 2024e).

Local education officers assess schools' experience with digital technology and mediate national demands on technology implementation. For example, the National Council of Governors of Education, composed of the heads of the Metropolitan and Provincial Offices of Education, requested a delay in the introduction of AI textbooks for certain subjects (D. Jung, 2024) and ensuring proper time to induct teachers into the changes (GEM Report, 2025). As a result, the introduction of AI-based digital textbooks for social studies and science has been postponed for primary and lower secondary schools and removed for privacy concerns for some classes (M. H. Lee, 2024).

In their monitoring capacity, local education officers support schools in their digital transformation process. Participating in the Leading Digital School Project, launched in 2023, is considered as an award for principals and other school leaders who have successfully integrated digital technology and AI-based digital textbooks. The project was expanded from 351 to 1,046 schools throughout the country (Republic of Korea Ministry of Education, 2024f). In an attempt to develop resources, 11 Provincial Education Offices were engaged in building an integrated AI learning platform combining learning data and provincial resources, while maintaining local diversification.

In another example, in line with the national digital competency framework, the Gyeonggi Provincial Office of Education, the most populous of the country, has developed its own Digital Citizenship Framework, focusing on online ethics, critical thinking and digital creativity competency. In its 2025 Basic Plan for Policy Implementation, the Gyeonggi Office of Future Education has identified key areas for digital transformation, including the equitable expansion of digital infrastructure and strengthening digital literacy.

SCHOOL AND TEACHER LEADERS DECIDE ON APPROACHES TO DIGITAL LEARNING

Principals allocate school budgets to purchase digital resources (OECD, 2023a). According to the 2022 PISA, a solid majority of Korean teachers (76%) benefit from great autonomy in decisions about how to use learning materials (OECD, 2023b). Teachers exercise leadership by adapting and customizing learning materials, including digital textbooks (**Box 5**). Consulting teachers in technology decisions is planned to expand, leveraging their experience to inform an EdTech information platform, through which teachers will exchange information and try digital technology for free (Republic of Korea Ministry of Education and KERIS, 2023). The role of teachers has also been fundamental in the development of the Digital Education Code of Conduct, released in March 2023 (Republic of Korea Ministry of Education, 2024c).

Teachers take on multiple middle leadership roles. It is planned that two or three leading teachers per school will be appointed to guide technology-mediated lessons and assessments and to develop school-specific implementation strategies. They will also mentor peer teachers and serve as trainers in local professional development programmes (Kwon, 2024; Republic of Korea Ministry of Education, 2024b, 2024c). New leadership

roles have been introduced to support the school digital transformation process with plans to hire 1,200 digital tutors to manage the set-up and maintenance of digital equipment – and relieve teachers of these responsibilities (Choi, 2024). Technology support centres will be set up in each metropolitan education office to take care of equipment operations and ensure the effective implementation of AI digital textbooks (Asim et al., 2024; S. Jung, 2024).

BOX 5.

Korean teachers are expected to lead the introduction of AI-powered digital textbooks

Digital textbooks were first conceptualized in 2007 and fully introduced starting from 2018 to integrate online and distance learning and expand access to content (Seo, 2023; Lee and Kwon, 2024). As part of its digital transformation efforts, the Republic of Korea has recently launched a plan to progressively introduce AI digital textbooks in 2025 to be fully implemented by 2028. AI digital textbooks use AI to customize content, gather real-time data, provide feedback and adjust the learning experience (Republic of Korea Ministry of Education, 2023a; GEM Report, 2025). By February 2025, some 3,870 schools, or about one third of all primary and secondary schools in the country, had been selected to integrate these textbooks into their curricula.

When teachers have the autonomy to design curriculum and instruction, digital textbooks can become an effective pedagogical tool. Digital textbooks help teachers promote student motivation, interest and confidence. Yet teaching methods are still crucial for influencing learning outcomes (Jang et al., 2015; Lee and Kwon, 2024). As outlined in the General Guidelines of the 2022 Revised National Curriculum, the role of teachers is expected to shift from providing knowledge to facilitating learning through personalized support. Generative AI can assist teachers to design personalized and adaptive teaching and learning content. Teachers can track students' performance and use analytics and real-time insights to tailor their approach to meet individual needs (Asim et al., 2024)

However, concerns have been raised concerning the adaptability of materials. As adaptation depends on diagnostics, teachers are expected to be prepared and aware of how to adjust the content to meet equity and quality standards (Elliott and Kim, 2025). They also need to be equipped with knowledge of data management and the ability to analyse data effectively (S.-M. Lee and Bang, 2025). Criticism has been raised about the potential of turning teachers into service providers. Teachers' agency that develops through direct interaction with students may be eroded (Ro, 2025). While technology may alleviate them of the burden of administrative tasks (Taguma, 2024), content customization still remains a time-consuming practice (Elliott and Kim, 2025). While students' agency is expected to be expanded in self-directed learning, teachers' roles will evolve into being curators, facilitators and socioemotional supporters (S.-M. Lee and Bang, 2025). Such a shift requires leadership qualities that have not yet been tested at such a large scale.

OFFICERS, PRINCIPALS AND TEACHERS ARE BEING PREPARED TO TAKE ON TECHNOLOGY LEADERSHIP ROLES

Outside of open competitive examinations, experienced professionals have been increasingly selected for government positions which require a high level of technology expertise (Republic of Korea Ministry of Personnel Management, 2025a 2025b). Metropolitan, provincial and district education officers' preparation and attitudes towards digital transformation is key. Local education offices have access to targeted training programmes at the local level. For example, the Seoul Jungbu District Office of Education held an AI competency session for administrative assistants and office support personnel in 2024, which was focused on preparing them for the use of digital textbooks and other digital tools. The office planned to expand the training over the next two years to include other categories of education support staff to strengthen digital competencies (Seoul Jungbu District Office of Education, 2024).

More than 80% of school leaders have completed a programme or course in school administration or training for principals, and 94% have completed an instructional leadership training programme or course before entering the position (Taguma, 2024). While completing such national training courses does not guarantee a candidate's appointment, they are a prerequisite for being considered (Republic of Korea Ministry of Education, 2023c). Since 2023, the course has included a module on Digital-Based Educational Innovation. This module is designed to strengthen digital leadership for advanced technology school environments for secondary school principals. Key topics include understanding and applying AI digital textbooks, strategies for enhancing digital competencies, and planning for digital infrastructure in schools (Republic of Korea Ministry of Education, 2024g).

Principals in the Republic of Korea are older than the OECD average (Taguma, 2024), which may cause some resistance to transformative change (Navaridas-Nalda et al., 2020). They also tend to rotate every four years, which may be a disincentive to change. Piloted in 2024, the Digital Leadership Enhancement Programme aims to address this shortcoming and equip principals with communications and content creation skills, a basic understanding of digital tools, AI-enhanced instruction and data-driven management competencies (Jang et al., 2024).

According to 2023 Trends in International Mathematics and Science Study (TIMSS) data, 43% of teachers reported being confident and 54% somewhat confident in using digital devices to improve student learning (Mullis et al., 2023), which suggests a high rate of self-efficacy (Taguma, 2024). More than half of teachers surveyed by the Korean Educational Development Institute (KEDI) acknowledged the potential of digital technology to facilitate teaching and personalize learning. Yet they also reported obstacles related to rigid curriculum and evaluation, infrastructure management and maintenance, and the need for constant financial support (Jung et al., 2022).

The introduction of AI adds a layer of difficulty. In a study on AI-leading primary schools, teachers reported being least confident in content knowledge, technological and pedagogical knowledge relevant to AI. They also reported challenges in designing age-appropriate content and facilitating students' interaction and collaboration (Kim and Kwon, 2023). Teachers also express concerns about the negative impact on teacher–student interaction, socialization and dependence from the introduction of AI (Lee et al., 2024).

Future teachers are now expected to have digital competencies. Since 2023, digital literacy has been a mandatory course of the teacher training curriculum, as outlined in the Detailed Standards for Acquiring Teacher Certification for pre-primary, primary, secondary and special education teachers. It aims to equip new teachers with the skills necessary for interdisciplinary education involving AI and big data (Republic of Korea Ministry of Education, 2022b). There is broad agreement on the need to restructure teacher education to respond to changing educational needs. In 2023, the Ministry of Education initiated discussions to develop a teacher education reform (Ayhan, 2024), engaging with teacher training institutions (Republic of Korea Ministry of Education, 2023d).

In 2024, a new position of 'Leading Teacher' was established for serving teachers identified by the Ministry and local education offices as committed to instructional improvement and peer collaboration. Their role is to spearhead innovation in teaching and assessment for the digital era, develop school-level implementation strategies, mentor colleagues and serve as trainers in local professional development programmes (Republic of Korea Ministry of Education, 2024c). Teachers' agency in driving transformation is being prioritized through targeted capacity-building initiatives. The local budget allocated to teacher training has increased from 3% to 3.8% in 2024–26 to support 'teacher-led classroom revolution' and train 300,000 teachers and 34,000 leading teachers by 2026 (Kwon, 2024). The Teacher Re-training Project focuses on school digital infrastructure, AI-powered digital textbooks and digital competencies.

A collaborative culture is generally promoted in various ways (Taguma, 2024). Digital transformation has encouraged teachers to form communities of practices (So et al., 2021). Initiated as knowledge-sharing service, Knowledge Fountains and ITDA have led to a community of practice on technology integration (Seo, 2023). The Autonomous Class Innovation Support Plan also promotes the development of a platform for teachers to share instructional practices and assessment materials. The Plan financially supports 200 teacher research groups and learning communities across the country, with a plan to expand support to 600 groups in 2025 (Republic of Korea Ministry of Education, 2024a).

Teachers took a leading role in exchanging online content and information, especially during the COVID-19 pandemic. For example, the e-learning hub Hakgyogaja ('Let's go to school') was created by teachers to share their practices with each other; it was complemented by YouTube videos (UNESCO, 2022b; Vincent-Lancrin et al., 2022). Teachers collaborate on digital resource creation and sharing. The platform Jisik Saemteo ('Knowledge Fountains') facilitates peer feedback and training from fellow teachers (OECD, 2023b).

Teachers also collaborate with external actors. The AI Education Alliance and Policy Lab (AIEDAP), a government agency that provides comprehensive pre- and in-service teacher training, has established six consortia consisting of two to five teacher training universities (Republic of Korea Ministry of Education, 2022a; Lim et al., 2024; AIEDAP, 2025). Established by the Ministry of Education in 2021 in selected provinces, the Regional EdTech SoftLAB is an organization with the mandate to develop evidence-based education technology based on teacher evaluation and case studies, which has so far verified over 70 education technology solutions (Republic of Korea Ministry of Education, 2024d).

Finally, parental involvement is fundamental (So et al., 2022). The Ministry of Education explained the AI digital textbook initiative to parents and gathered their feedback on digital-based education innovation (Republic of Korea Policy Briefing, 2024). Hakbumo Onnuri, a digital platform for parents, is an example of local government efforts to communicate and cooperate with families (So et al., 2021). Schools implement their own strategies. A lower secondary school in Gyeonggi Province, visited for this report, collects parents' feedback about their children's experience with technology to define the school's approach.

How should countries support leaders to digitally transform their education systems?

East Asian countries are at the forefront of global efforts to digitally transform economies, societies and education systems. China, Japan and the Republic of Korea have been among the earliest adopters of measures to apply advanced technology in classrooms. China embraced the concept of smart education and its emphasis on personalized learning with its Education Informatization Plan 2.0 in 2018. Japan introduced the GIGA School Programme in 2019 but accelerated it rapidly in light of COVID-19. The Republic of Korea's latest master plan supports AI-powered digital textbooks. AI has been at the heart of the latest initiatives, which is likely to change teaching and learning processes for several curriculum objectives. Relations between leaders, teachers and learners could be redefined. The use of data for monitoring, diagnosis and subsequent guidance is expected to be amplified.

This does not mean that the three countries are following the same path. They differ in significant ways. For example, China has focused on integrating AI into learning platforms and has experimented with the use of technology to observe classroom proceedings; the Republic of Korea has championed textbook reform; and Japan espouses the 'pedagogy first, technology second' principle. But all three continue to roll out some of the most ambitious reforms in the world. Their experiences yield lessons for other countries considering digital transformation.

This regional edition does not go into the substance of these reforms. As the 2023 *Global Education Monitoring Report* recommended, policymakers need to ensure that education technology investments improve learning, do not increase inequality, can be scaled up, and are sustainable not only from a financial but also from a social and environmental perspective. Policymakers need to avoid the tendency to jump on the latest available technology. They should not confuse the need to learn about technology – which is inarguably part of a modern basic skill set – with the need to learn *through* technology, whose value needs to be proven through research. But there is no doubt that the three countries have embraced digital technology and are willing to experiment with its education implications.

This regional edition therefore takes these ambitious reforms as a given and only draws attention to their implications for actors with system and school leadership roles in the education systems. New and demanding tasks for existing leaders and new leadership roles are emerging. In China, school principals have been recast as chief information officers. The Japanese GIGA school programme and the Korean Master Plan VII envisage an active role for school leaders in personalized learning. The question is what support measures are needed for these leaders to facilitate, rather than block, the implementation of these reforms. This section synthesizes governments' main actions in this direction and the work that remains.

NATIONAL POLICY FRAMEWORKS NEED TO BE CLEAR AND COHERENT

A key **challenge** is that education systems are changing at a breakneck speed in the region. There is limited time to plan coherently. Imposing centralized control could stifle innovation and local initiative, which is needed at a time of rapid developments. Yet unplanned expansion can lead to coordination problems and additional burdens on system and local leaders, who need to find the most efficient and effective ways to invest in digital education technology. Systems may not be interoperable, duplication of effort may be rife, monitoring systems may be underdeveloped, and avoidable costs may be incurred.

Countries in the region have tried various **solutions** to improve coherence. For example, they have attempted to introduce nationwide learning management and assessment systems. China has already integrated 32 provincial platforms into a unique national Smart Education Platform, organized by education level and track. Provincial authorities can still adapt the platform to local needs and can opt for additional platforms. For example, the Changsha Education Bureau in Hunan Province established the Everyone Connected Space platform. In the Republic of Korea, five education offices have their own AI learning platforms. The Gyeonggi Education Digital Platform, Hi Learning, for example, aims to develop student learning experiences and facilitate efficient teacher pedagogical practices. It serves as a central hub for digital resources and tools for schools within the province. Local education officers are being consulted to merge their platforms into a national one. But Korean authorities have also encountered opposition to the adoption of AI-powered textbooks. The National Assembly decided to reclassify them from core to supplementary learning materials, leaving it schools' discretion (Jung, 2024). Voluntary adoption could lead to universal application if the central government sets a standard and accompanies it with incentives, as was the case with the computer-based testing system in Japan (OECD, 2023a).

The development of interoperable systems is also a step towards coherence. Japan developed Education Data Standard 4.0 in 2023, which outlines definitions and formats to facilitate seamless data transfer between municipalities and schools. The centralized National Educational Information System in the Republic of Korea covers administrative school management data, drawing

on 17 municipal and provincial systems that operate independently. Korean schools also have to implement a wired and wireless network control system to ensure AI learning data security.

System leaders committed to the success of ambitious digital education reforms need to ensure equitable access to resources. In China, infrastructure programmes have targeted rural areas designated for poverty alleviation efforts, while the ICT training programme for school principals has targeted prefectures in remote and ethnic minority areas. Under the GIGA programme in Japan, the use of local resources to fund additional ICT equipment appears to have targeted socioeconomically disadvantaged households and to have reduced the gap in the ICT use rate relative to wealthier households. Led by the Ministry of Education in the Republic of Korea, One Student, One Smart Device is a national-level initiative rolled out across all provinces.

Yet system leaders are under pressure to demonstrate results, which means favouring areas with good initial conditions for experiments with technology. Such targeting risks increasing inequality. For example, Smart Education Demonstration Zones in China tend to be located in privileged urban areas. Since 2023, the Republic of Korea has provided financial incentives to more than 1,000 Digital Leading Schools that have led on the integration of AI-based digital textbooks (Republic of Korea Ministry of Education and KERIS, 2023). However, this process is led by their school leaders and may therefore exacerbate disparities if the leaders have different levels of capacity and commitment. In Japan, monitoring mechanisms to assess progress in digital transformation are informal and may not identify those schools most in need (OECD, 2023a).

SCHOOL LEADERS NEED CLEAR GUIDANCE AND OTHER SUPPORT TOOLS

Another **challenge** from rapid change is that system and school leaders may be left without sufficient guidance, especially when important decisions are left to their discretion. East Asian countries tend to assign decision-making authority on school budget allocations to local governments. Among those that have participated in PISA, for instance, 61% of students in Beijing, Shanghai, Jiangsu and Guangdong, 59% in the Republic of Korea and 48% in Japan were in schools where local (and to a lesser extent central) authorities held the main responsibility for school budget allocations. This was not the case in the Special Administrative Regions of Hong Kong and Macao, given their urban context (**Figure 2a**).

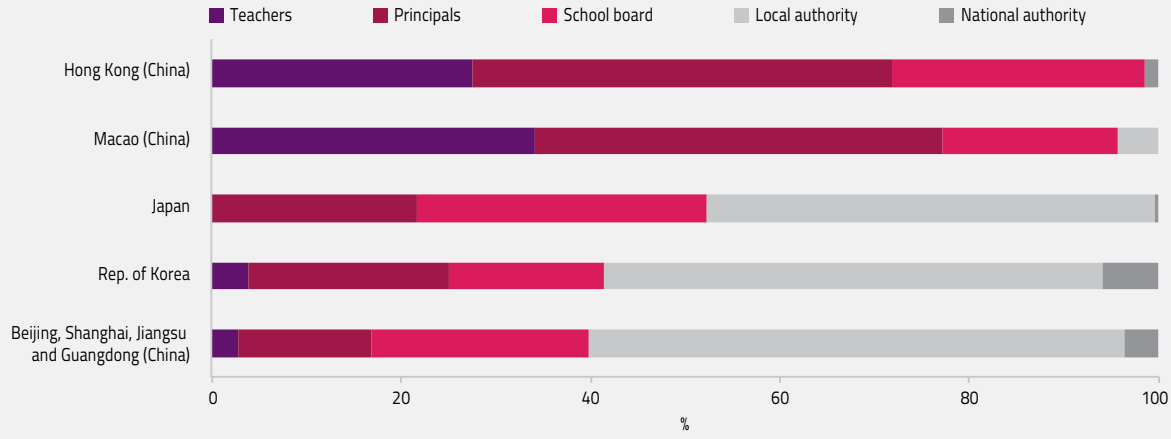
Decisions on key aspects of learning, in contrast, are more likely to be taken at the school level. For instance, among countries and territories that have participated in PISA, 96% of students in Japan and 75% of students in the Republic of Korea were in schools where the main responsibility for curriculum lies with school actors (teachers, principals or boards). The equivalent share was only 26% in Beijing, Shanghai, Jiangsu and Guangdong (**Figure 2b**). But nearly two in three students from Beijing, Shanghai, Jiangsu and Guangdong were in schools whose content was decided by subnational education authorities (OECD, 2016). Likewise, the selection of learning materials, which is closely tied to decisions about how technology is integrated into the classroom, is made by teachers (52%) and principals (45%) in Japan and mainly by teachers in the Republic of Korea, where they can decide how to adapt the national AI curriculum based on interest and capacity (UNESCO, 2022a).

FIGURE 2.

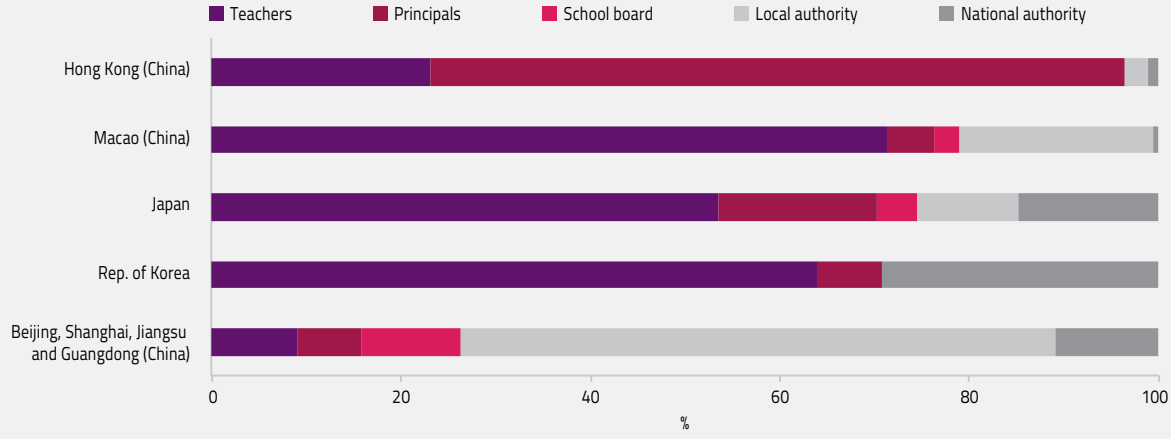
The extent of school principals' decision-making authority varies in East Asia

Distribution of 15-year-old students, by main decision maker, selected East Asian countries and territories, 2022

a. School resources



b. Curriculum



Note: Data for Beijing, Shanghai, Jiangsu and Guangdong are from the 2015 PISA.
Source: OECD (2016, 2023c).

Autonomy accompanied by well-defined responsibilities and sufficient support is an essential part of a **solution** that improves school leaders' chances to make a difference (Pont et al., 2008) and to strategically guide their schools through significant shifts to digital technology (Witthöft et al., 2025). More autonomy enables innovation in and adaptation to school needs, while less autonomy hinders change and collaboration (UNESCO, 2024). But clear policy guidelines and standards are necessary to frame the responsible and effective roll-out of technology in teaching and management.

Guidance for curriculum implementation has recently been updated to tackle emerging technologies (Boeskens and Meyer, 2025). The General Guidelines of the 2022 Revised National Curriculum and the 2023 Digital-driven Education Reform Plan outline how to implement AI-based digital textbooks in Korean schools, even if responsibility remains ultimately with schools (Vidal, 2023). In Japan, the Guidelines for Use of Generative AI in Primary and Secondary Education, updated in 2024, define the appropriate use of generative AI in education and highlight potential risks for personal information, privacy and copyright (NHK, 2024; Vidal, 2023).

Central authorities have released other guidelines on ethics and technology. The Republic of Korea has introduced guidelines for the healthy, safe and responsible use of digital devices. Informed by consultations with teachers, a Digital Education Code of Conduct outlines

core values and principles for digital transformation (Republic of Korea Ministry of Education, 2024c). The Office of the Privacy Commissioner for Personal Data of Hong Kong, China, provided Practical Tips for Parents and Teachers in 2015 (Hong Kong Education Bureau, 2015).

While teachers and school leaders often have significant pedagogical autonomy, central and local education authorities can provide guidelines to support the effective integration of digital education resources, including through guidance on procurement (**Box 6**). The promotion of video resources through online libraries helps establish a supportive environment for using ICT in teaching and learning (Kuang et al., 2018) This is widespread in East Asian countries. MEXT, for example, has issued and updated Guidance on Informatization of Education over the past years with examples of how to integrate ICT use into different subjects in the classroom (Japan Ministry of Education, Culture, Sports, Science and Technology, 2019b). MEXT also provides instructional videos, training materials and best practices to facilitate the implementation of digital transformation.

BOX 6.

Decisions on education technology procurement are shared across levels

Procurement of technology can be defined as semi-centralized, as the central government tends to have the responsibility for setting up and maintaining digital education infrastructure. This approach helps focus on equitable access and can contribute to system efficiency (Vidal, 2023). Central authorities support direct negotiations with suppliers of digital devices and also provide procurement guidelines to local authorities (Boeskens and Meyer, 2025).

Multiple actors can help inform better choices for procuring education technology (UNESCO, 2023). In China, the central government issues policy guidelines, the overarching direction and objectives and establishes technical standards to ensure the compatibility and interoperability of digital education systems across provinces. In Japan, MEXT defines standards for digital infrastructure. It is then the responsibility of system leaders at the prefecture and municipality levels to define their priorities and procurement plans to accomplish their ICT utilization objectives.

Regional education authorities provide procurement guidelines to schools in the Republic of Korea. They are encouraged to set up cooperative systems with local technology providers to ensure consistent and timely maintenance of the infrastructure (KERIS, 2016). As a result, many regions have developed their own digital learning platforms.

Local education offices take the lead on procuring relevant infrastructure in the Republic of Korea, while school leaders purchase, for instance, digital content and teaching and learning products (OECD, 2023a). In Japan, municipalities decide for primary and lower secondary schools, while prefectures decide for upper secondary schools how to allocate national GIGA programme funds in line with their priorities (Vidal, 2023). They procure a wide range of products and services for schools, including connectivity, devices, software, content and cybersecurity services (Boeskens and Meyer, 2025).

School leaders can purchase some technology products and services with their own budgets, according to defined rules. School leaders in Japan and the Republic of Korea can purchase additional digital products and services, defined ad hoc by the Ministry based on a list of products or based on its function. In Japan, this list is restricted to teaching and learning software and to digital content. The central government ensures a common base for equitable access to digital resources across schools (Vidal, 2023; Boeskens and Meyer, 2025).

SYSTEM AND SCHOOL LEADERS NEED TO BE PART OF EDUCATION TECHNOLOGY DECISIONS

When introducing digital technology to education, a common global **challenge** is the heavily top-down nature of reforms, as schools try to keep up with the large scale and rapid pace of change. The 2023 *Global Education Monitoring Report* showed that school staff are often left out of decisions to select new digital technology: in a survey of 94 countries, 45% of teachers reported that their unions had not been consulted at all, while 29% had been consulted on 'only a few aspects' of introducing new digital technology. The top-down approaches could be because of a perceived time pressure to not fall behind and because of the advanced nature of the technology involved.

Yet the use of digital platforms can have an impact on essential pedagogical functions. They can reduce autonomy and restrict principals' and teachers' ability to choose the tools they think are more appropriate. They can define education, in terms of shaping content, intended learning outcomes, their measurement and assessment in ways that fit big data analytics and suit technology – but may not be in the best interest of students and teachers. Fundamental pedagogical decisions, which have long been entrusted to schools and teachers, may gradually move to external actors without the scrutiny and debate that should characterize curriculum and textbook decisions.

Consultation is a necessary part of any **solution** that is pedagogically appropriate. It is necessary to bring together education authorities at the national and local levels, school actors, students and parents to inform school transformation, teacher training, education content and privacy discussions. Mechanisms are needed to strengthen the representation of various stakeholders in policy design, implementation and monitoring. Consultations provide essential opportunities to draw attention to issues to which the technology industry may be paying less attention or to which they have no interest. Participation in the design of digital transformation plans and policies helps ensure buy-in by all stakeholders (Timotheou et al., 2023; Willermark et al., 2024).

In East Asia, there is a tradition of centralized, hierarchical planning with local education officers ensuring the cascading down of the objectives and coherence of the national vision. But countries are also introducing mechanisms to get feedback from education leaders. Japan and the Republic of Korea consulted teachers, businesses and subnational representatives for the development of their digital strategies. Japan also involved student representatives (Boeskens and Meyer, 2025).

The Republic of Korea engages teachers at the subnational level through the collection of feedback and experiences. The 2023 White Paper aimed to strengthen consultation and established an EdTech Information platform for teachers to be more formally engaged (Republic of Korea Ministry of Education and KERIS, 2023).

Set up in 2022, AIEDAP in the Republic of Korea serves as a cooperative governance structure, which promotes consultations and collaboration between leaders to build trust and a network of mutual support. In Japan, a specialized department within the Board of Education at the prefecture level aims to distribute leadership involving the municipalities of the prefecture on data security, networking and digital education regulations.

Coordination efforts can go beyond the education sector (Boeskens and Meyer, 2025). Kagawa DX Lab in Japan and EdTech SoftLAB in the Republic of Korea are public–private partnerships that bring together expertise from private companies, school leaders and teachers, who collaborate on pilot initiatives and identify education technology solutions through evidence-based development. Operating at the subnational level, this model has also been extended to higher education in the Republic of Korea.

A COLLABORATIVE MANAGEMENT CULTURE IS NECESSARY FOR SUSTAINABLE CHANGE

The **challenge** of consultation is not limited to relationships between levels of government. It is also related to the way schools are managed and how decisions are taken to reflect the perspectives and experiences of school community members. Collaboration can promote mutual support and create a sense of school community around a shared objective (Pont et al., 2008).

The 2024/5 *Global Education Monitoring Report* pointed to distributed leadership as a necessary part of any **solution** to difficult questions related to a school's direction, for example, concerning digital education. Digital transformation is about more than just technology adoption; it involves a systemic cultural shift towards teaching and learning (Bond et al. 2018). It implies the implementation of a structured process and a set of tools that can support positive changes for learners, teachers and school leaders (McCarthy et al., 2023).

Communities of practice and professional networks among school leaders can help them learn from each other's experiences and to share knowledge. All countries and territories are encouraging that in East Asia. Hong Kong,

China, has emphasized building digital leadership through professional networks in its Fourth Strategy on Information Technology in Education (Chen, 2025). In mainland China, schools share resources and provide mutual support to policy implementation through formal partnerships, known as Education Collectives. The Autonomous Class Innovation Support Plan in the Republic of Korea financially supports teacher research groups and learning communities.

Local education offices facilitate collaboration among and between schools. Qinghai Province in western China, for example, has built partnerships with the education institutions of the advanced Jiangsu and Zhejiang provinces and the municipality of Shanghai to accelerate digital education through the exchange of digital resources. In the city of Shenzhen, a collaborative education network supports teachers to engage with national experts, municipal and district officers and master teachers on teaching strategies. In Japan, the Takamatsu City Board of Education publishes a digital newsletter, GIGA News, to inspire principals and teachers with examples of effective school practices. It also provides an online learning space where teachers can voluntarily follow lectures on issues such as ICT integration and student counselling.

School leaders play an important role in facilitating a shift in culture toward digital transformation through communication and collaboration. School principal support has been particularly relevant in the introduction of technology in Japan (Japan National Institute for Educational Policy Research, 2022). Bottom-up processes can significantly influence the pace and efficacy of digital transformation (Chen and Kouhsari, 2025). The Community of 10,000 Teachers in the Republic of Korea has brought together volunteer teachers to support each other in implementing distance learning (UNESCO, 2022b).

School leaders are expected to support teachers, especially when they rotate, a common practice in East Asia. In Japan, public school teachers undergo a mandatory rotation every five years (*jinji idou*), a practice managed by the prefectural Board of Education (Seebruck, 2021). In the Republic of Korea, rotation occurs every two to five years (Li, 2021). Introduced in 2014, China has scaled up its within-province teacher rotation policy (Liao et al., 2019). Teacher rotation can foster a sense of community and solidarity among teachers (M. Yang et al., 2023). But while teacher transfers are recognized for their potential benefits to equity and quality, they require school leaders to invest additional time and effort to effectively support the transferred teachers (Liao et al., 2019), including in the use of technology.

Collaboration between schools and parents is also important for digital transformation (Dexter and Richardson, 2020). While technology is a valuable tool for facilitating communication between them, parents have valid concerns about the use of digital technology, which school leaders can alleviate through communication. In Japan and the Republic of Korea, surveys are used to gather parents' feedback on teaching practices. School leaders keep families informed about education policies, teaching methods and data use through regular parent meetings and social media platforms.

EDUCATION LEADER SELECTION AND TRAINING NEED TO FIT THE PURPOSE OF DIGITAL TRANSFORMATION

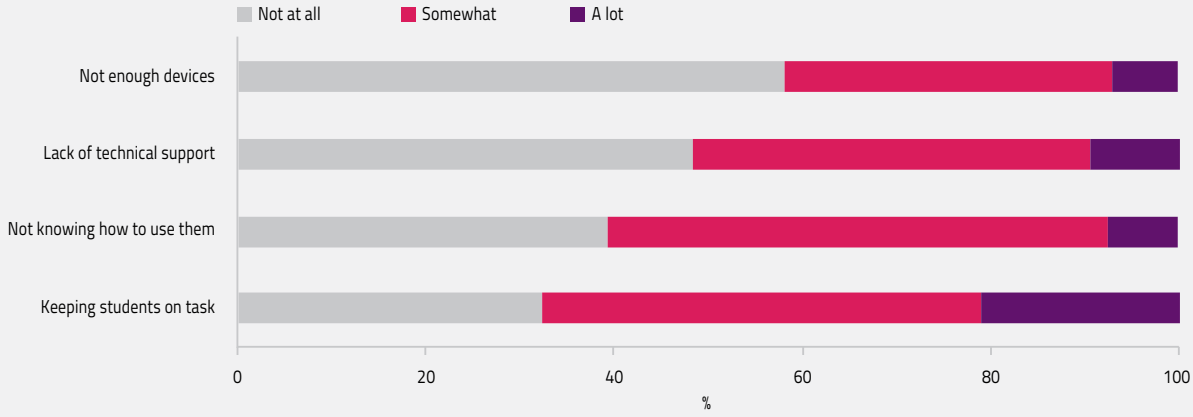
Education leaders' insufficient familiarity with technology is a **challenge** that can slow down digital transformation in the classroom. Moreover, school leaders with positive attitudes towards technology can facilitate a cultural shift among teachers (Navaridas-Nalda et al., 2020). In Japan, over 60% of teachers reported that digital resources reduced lesson preparation time. In the Republic of Korea, over half of teachers viewed digital transformation as 'enabling personalized learning support for students, enhancing students' digital skills through coding and ICT education, and facilitating teaching and learning using digital devices and textbooks' (H. Jung et al., 2022). In China, teachers know how to use ICT for planning and preparing lessons but require more support for integrating ICT in teaching (L. Yang et al., 2023).

Teachers may lack confidence in using technology to teach. In China, younger teachers with fewer years of teaching experience are more likely to have higher levels of digital competences (L. Yang et al., 2023). This problem is exacerbated given that principals are older than teachers. According to the 2023 TIMSS, grade 8 science teachers in Japan and the Republic of Korea were relatively more likely not to have used devices because of their lack of knowledge rather than because of the lack of sufficient devices or technical support (**Figure 3**); some 77% of teachers in both countries said they needed professional development to integrate technology in their teaching.

FIGURE 3.

Teacher knowledge gaps hinder the use of technology in science instruction

Percentage of grade 8 students whose science teachers reported selected barriers preventing them from using digital devices in instruction, Japan and the Republic of Korea, 2023



Source: 2023 TIMSS database.

Potential **solutions** for this issue are changes in selection processes and training programmes for system leaders, school principals and teacher leaders. In East Asia, education officers in the public administration are selected through highly competitive standardized tests and promoted through a career-based system (P. S. Kim, 2020; Howlett, 2022). While knowledge of technology and digital skills are not systematically listed among recruitment criteria, clearly defined job roles make it easier to attract people with relevant expertise. Japan and the Republic of Korea have been relying more on talent-based recruitment, rather than general qualifications (Gerson, 2020; Japan Ministry of Education, Culture, Sports, Science and Technology, 2024b).

Pre-service and induction training for new appointees provide education officers with key knowledge and the opportunity to network with other professionals (Marijani, 2017). China and the Republic of Korea stand out for preparing future administrators with essential computer and digital skills through public administration programmes (McQuiston and Manoharan, 2020). The Republic of Korea has also launched targeted leadership and technology programmes for new civil servants, although these are not education specific (National Human Resources Development Institute, 2025a; 2025b).

Professional development opportunities may compensate for a lack of adequate competencies among already recruited staff. In China, special training sessions on education digitalization have been provided for provincial and municipal education bureau directors. Between 2018 and 2024, most provinces trained newly appointed and incumbent bureau directors (China Ministry of Education, 2025b). Japan addressed skills shortages through the development of a Digital Skill Standards framework for digital transformation personnel and targeted training provision (Japan Intercultural Academy of Municipalities, 2020; Japan Ministry of Economy, Trade and Industry, 2023).

Criteria for the selection of school principals are generally defined at the central level, with some adaptation to local contexts possible (China Ministry of Education, 2018; Republic of Korea Ministry of the Interior and Safety, 2021). But digital competencies are not explicitly mentioned among the selection criteria. In Japan, local appointing authorities have been asked to include proficiency in digital skills when recruiting principals and teachers (Japan Ministry of Education, Culture, Sports, Science and Technology, 2025c). Such criteria are used in internal promotion processes, for example, for teacher leaders. In the Republic of Korea, teachers are selected to lead digital innovation based on their experience with AI digital textbooks and recommendations on the basis of their commitment and leadership (Republic of Korea Ministry of Education and KERIS, 2023). In Japan, school leaders assess and select leaders for the GIGA programme. In Minato City, Tokyo, each school designates an ICT lead

teacher as a GIGA Leader to promote collaborative learning. One school visited for this report had selected two GIGA Leaders who had integrated ICT into their lessons.

All education systems in East Asia regulate pre-service training for school principals to ensure a focus on leadership. New principals in China are required to obtain a Certificate of Qualification Training either prior to the start of the position or within the first year of appointment. Principals are expected to become visionary leaders (*jiaoyujia*) and innovate school management practices through social influence, distinct educational styles and outstanding education capabilities (Chen et al., 2024). Incoming principals in the Republic of Korea are required to undergo a certification training that includes a focus on innovation. The Principal Qualification Training Programme prepares principals to understand national education policy, respond to change and manage education innovation strategies (Republic of Korea Ministry of Education, 2019). Since 2023, the programme for secondary school principals includes a Digital-Based Educational Innovation course (Republic of Korea Ministry of Education, 2024g).

In-service training for principals is mainly the responsibility of central authorities. In Japan, the National Institute for School Teachers and Staff Development collaborates with MEXT to provide training initiatives for educational leaders. Implementation guidelines for principal training issued in 2025 include a focus on ICT use (Japan Ministry of Education, Culture, Sports, Science and Technology, 2025b). In China, the Ministry of Education ICT Leadership Training Programme for Primary and Secondary School Principals has reached over 60 prefectures and counties across 10 provinces and autonomous regions and trained over 10,000 principals.

East Asian countries have also included digital skills in teacher competency frameworks, which have been updated to include the use of AI. In Hong Kong, China, the Teacher Competencies Framework is part of the 2022 Guidelines on Teachers' Professional Conduct and includes teaching skills in the use of ICT (Hong Kong Education Bureau, 2022). In China, teacher digital competence is included in the Teacher Education Revitalization Action Plan 2018–2022 and outlined in the Guidance on Promoting the Healthy Development of Online Education (L. Yang et al., 2023). In 2025, the Teacher Digital Literacy education industry standard was introduced, adding AI within its scope. A digital literacy assessment was conducted involving some 610,000 teachers and 3 million students across 24 provincial-level administrative regions (China Ministry of Education, 2025b). In Japan, MEXT recently released Guidelines on the Use of Generative AI in Primary and Secondary Education (Japan Ministry of Education, Culture, Sports, Science and Technology, 2025d).

Many teacher capacity development programmes have incorporated elements of digital skills. Subnational offices are playing a leading role in their provision. In the Republic of Korea, Regional Project Support Teams bring together local education offices and teacher training institutions to conduct pilot projects to strengthen teachers' AI and digital capabilities. In Japan, guidelines on primary school principal and teacher quality indicators, updated in 2025, and the Special Act on Education Public Servants mandate principals and appointing authorities to create a record of and provide guidance on teacher training. Prefecture boards of education provide role-based training programmes on ICT integration as part of the Plan for Promoting ICT in School Education (Japan Ministry of Education, Culture, Sports, Science and Technology, 2020d, 2025c). In 2023, among grade 8 science teachers, 22% in Japan and 46% in the Republic of Korea reported having participated in professional development on the integration of technology in science instruction, according to the TIMSS.

In China, central and local authorities work together to cultivate digital literacy. Between 2013 and 2022, the Ministry of Education implemented a national programme for enhancing primary and secondary school teacher IT application capacity, benefiting 23 million teachers (China Ministry of Education, 2025b). Hubei Province launched a programme to enhance teacher digital literacy, which has been extended to bureau directors, school principals and ICT coordinators (Hubei Province Department of Education, 2025). However, the training may not be comprehensive and cover all critical aspects of digital technology. For example, only the Hong Kong Special Administrative Region and the Republic of Korea reported explicitly covering cybersecurity and safety.

Universities, teacher training institutions and research institutes offer specialized training, partnering with schools to support teacher professional development in ICT (UNESCO, 2023; L. Yang et al., 2023). In Japan, Takamatsu Prefecture has engaged a local university to enhance teacher training quality. In China, Beijing Normal University partnered with 12 primary and secondary schools in Qinghai Province to train them in digital skills, digital teaching resources and ICT for student engagement and learning achievement.

SPECIALIZED STAFF ARE NEEDED TO HELP SCHOOLS AND LOCAL EDUCATION OFFICES

Despite efforts to develop their capacity, the rapid pace of change means that it remains a **challenge** for school and system leaders to keep up to date with all the latest technological developments. But if leaders lack the relevant expertise, devices may be purchased but remain unused **(Box 7**) and technology plans may be written but not implemented.

One **solution** for system and school leaders is to receive technical support from experts. In East Asia, subnational departments organize professional technical teams and recruit technical specialist staff to provide administrative and pedagogical support for digital transformation in schools. In some cases, additional actors have taken up functions to drive technological know-how (Hogan and Thompson, 2021). In Japan, MEXT has appointed School DX Strategy Advisors in support of local Boards of Education and schools. In China, the Educational Digitalization Expert Advisory Committee and a Special Task Force contribute to the implementation of the National Smart Education Platform.

Technical staff have taken the lead on setting up and maintaining IT across schools and local education offices. In China, schools lead on the appointment of specialized ICT coordinators and digital specialists to oversee the adoption and management of digital tools and training for using them. These specialists provide technical support, conduct professional development sessions, and ensure that ICT use is aligned with educational goals. In the Republic of Korea, digital tutors are planned to be hired to manage the set-up and maintenance of digital equipment, and relieve teachers of these responsibilities (Choi, 2024).

Introduced in 2021, mobile instructional staff and ICT support staff provide technical assistance and training and alleviate teachers from related pressures in Japan. A shortage of support staff had a negative impact on learning outcomes in schools with a high number of disadvantaged students. National evaluations have found that ICT support personnel assisted online learning during the COVID-19 pandemic (Japan National Institute for Educational Policy Research, 2022). Moreover, GIGA School Supporters and ICT professionals help design school ICT environments, set up devices, and create ICT usage guidelines to assist Education Boards and schools.

Teachers with specialist skills in the use of technology in the classroom can serve as middle leaders within schools and local education offices (Vincent-Lancrin, 2023). All three countries have employed specialized staff to support digital transformation efforts. Teacher champions in China, GIGA leaders in Japan and lead teachers in the Republic of Korea support their peers through coaching and personalized guidance in schools. In addition to technical support, ICT coordinators provide professional development (León-Jariego et al., 2020). ICT coordinators and digital specialists in China and ICT support staff in Japan also conduct in-school training sessions.

BOX 7.

Technical support is critical for ensuring digital textbooks are used effectively

Digital textbooks are a key driver for digital transformation in the region. They have dynamic content which can be updated. They can record real-time interaction (Fan et al., 2023). In the three countries, the introduction of digital textbooks has been nationally regulated and planned in phases. In China, the Ministry of Education issued standard digital textbooks for schools in 2022 (Wijaya et al., 2025). Japan amended the School Education Act in 2019 to allow their use. The Republic of Korea's Ministry of Education began implementing them in 2018 before gradually replacing them with AI-powered digital textbooks (Seo, 2023). Some 35% of grade 8 science teachers in Japan and the Republic of Korea who took part in the 2023 TIMSS reported using digital devices so that students could read textbooks and watch videos at least once a week. But at least as many reported using devices for this purpose at most a few times a year or never (**Figure 4**).

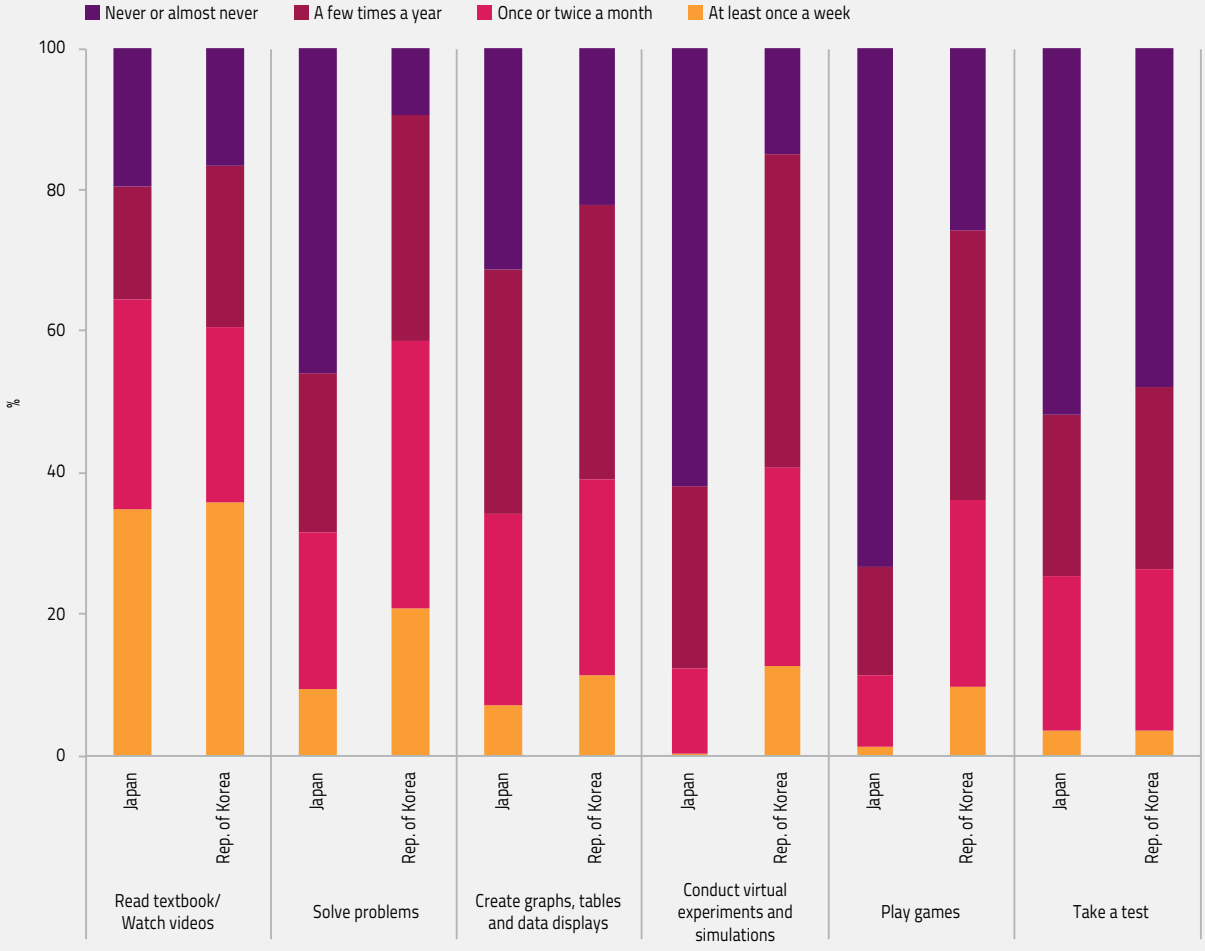
Continued on the next page

BOX 7. *Continued*

FIGURE 4.

Digital devices are mostly used as supportive tools in science instruction

Percentage of grade 8 science teachers reporting using digital devices in science instruction, by type of activity, Japan and Republic of Korea, 2023



Source: 2023 TIMSS database.

Teachers often lack the technical support to use such devices more consistently. According to a national evaluation, teachers from Japan confirmed their reluctance was mainly associated with technical issues. Studies conducted in China confirmed that teachers' willingness to use IT in teaching depended on the perception of a positive ICT environment, supported by the government and the school (L. Yang et al., 2023). Technology support centres are planned to be introduced in each metropolitan education office in the Republic of Korea to take care of equipment operations and ensure the smooth adoption of AI digital textbooks (Asim et al., 2024; S. Jung, 2024).

Conclusion

The application of digital technology in education is complex. It takes many forms, which are increasingly integrated. A succession of innovations, from devices to artificial intelligence, are transforming the ways administrators manage, teachers instruct, and students learn and interact. The pace of change is unrelenting: boundaries between the physical and virtual worlds are becoming increasingly blurry; people and machines are hyperconnected; and the capacity to store and process data is expanding exponentially. Shielding students from threats to their security and well-being is a top priority, as is the need for all learners to behave responsibly in the digital world.

Digital technology, like other technologies, is the process and result of human efforts to satisfy needs and improve lives. Its growth and the increasing reliance of education systems on it should always ensure learners' interests are centrally placed. Digital technology should not substitute for education based on human interaction but instead support it.

East Asia is a global hotspot for education digitalization. There is strong policy intent for utilizing and expanding technology but all actors – central government, local governments, schools and their communities – need to work together to achieve meaningful and ethical digital transformation.

The role of system, school and teacher leaders is critical for the success of the ambitious reforms underway but may have been underappreciated. These leaders are the conduit to both ensure these reforms are implemented in schools and classrooms as well as to gather and feedback information on the bottlenecks and problems encountered.

The world is looking at the East Asian education experiment with great anticipation. The following recommendations aim to identify steps system and school leaders can take to *lead for technology.*

- **National policy frameworks need to be clear and coherent**. Leaders should have a clear understanding of technology reforms and their objectives. They should be able to work with interoperable and robust monitoring systems, with access to adequate resources.
- **School leaders need clear guidance and other support tools**. Clear guidance and standards help leaders understand and ensure coherent digital transformation of schools. Well defined responsibilities and sufficient support combined with autonomy can improve school leaders' chances to make a difference.
- **System and school leaders need to be part of education technology decisions**. The views of those closest to the classroom level need to be solicited and reflected in policy design to ensure that reforms are pedagogically appropriate.
- **A collaborative management culture is necessary for sustainable change**. Leaders need to foster collaboration within and between schools through communities of practice. Collaboration between schools and parents is also important to address valid concerns about the use of technology. Such practices can promote mutual support and create a sense of school community around a shared objective.
- **Education leader selection and training need to fit the purpose of digital transformation**. The preparedness of education leaders deserves more attention by policymakers. Public policy on education leader selection and training should constantly evolve to match current needs and reflect the latest lessons learned from evidence.
- **Specialized staff are needed to help schools and local education offices**. Trained staff can relieve leaders of technical responsibilities and guide system and school leaders in the efficient and effective implementation of digital technology reforms.

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GLOBAL EDUCATION MONITORING REPORT

REGIONAL EDITION ON LEADERSHIP IN EDUCATION

East Asia

Lead for technology

Building on the themes of the last two global editions of the *Global Education Monitoring Report* – technology in 2023 and leadership in 2024/5 – this regional edition is the result of a partnership of the GEM Report with Beijing Normal University (China), Sophia University (Japan) and the Korean Educational Development Institute (Republic of Korea). It focuses on the role of education leadership for digital transformation in East Asia, a region where some of the world's most ambitious technology reforms are being implemented.

This report is based on three country case studies; descriptions of school leadership laws and policies from the GEM Report's PEER country profiles; and a background paper on education leadership and digital transformation. It documents the three countries' major efforts to prepare their local education officers, school principals and teacher leaders so that they can facilitate the effective and equitable roll-out of these reforms.

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