



Policy dialogues in focus for Brazil: International insights for digital education reform



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Introduction

Preparing learners for the digital transformation and ensuring no one is left behind is a priority for today's education systems. At the same time, capitalising on the transformative potential of digital technologies can help address persistent and emerging policy priorities in education. Effective, equitable and efficient digital education policies are therefore both an urgent need and an opportunity for all education systems.

Like many other countries in recent decades, Brazil has pursued efforts to extend access to and use of digital technologies across the education system. There has been considerable progress, not least in maintaining digital education as a high priority policy area for education. However, Brazil, like many countries, faces ongoing challenges to deliver impactful reforms that transform education at scale.

To support Brazil to strengthen efforts further, in July 2023, the OECD's **Education Policy Outlook** organised an online seminar series—*Policy Dialogues in Focus: International Insights for Digital Education Reform in Brazil* (Box 1).

Box 1. The Education Policy Outlook's *Policy Dialogues in Focus* series

The *Policy Dialogues in Focus* series offers timely and targeted policy dialogue events driven by an education system's specific needs. Setting an environment of trust and learning, the seminars mobilise the Education Policy Outlook's extensive knowledge base and large network of international senior policy makers to foster honest, practice-oriented conversations about what works well, what could work better and how to resolve key challenges in education policy. Discussions facilitate the co-construction of policy pointers for action that cover policy design, implementation, monitoring and evaluation.

In 2023, the *Policy Dialogues in Focus: International Insights for Digital Education Reform in Brazil* seminars brought together over 70 federal and subnational policy makers, civil society actors and researchers in Brazil working on digital education reform in basic education (pre-primary to lower secondary). Participants had the opportunity to learn from the reform experiences of six education systems (New South Wales (Australia), Chile, Colombia, Ireland, Korea and Mexico). The seminars also provided insights into other relevant international comparative and empirical work from the OECD.

The seminars covered two themes: 1) strengthening digital education governance and infrastructure reforms; 2) embedding digital technologies and pedagogies in quality schooling. This *Education Policy Perspective* builds on the main reflections and evidence of international practices shared during the seminars and expands on some of the key themes and priorities emphasised by Brazilian participants.

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Informed by discussions at these seminars and short case studies from six peer education systems (New South Wales [Australia], Chile, Colombia, Ireland, Korea and Mexico), this paper proposes three strategic **core considerations** for policy makers in Brazil to contemplate when pursuing digital education reforms. These take the form of key questions to guide the thinking of Brazilian policy makers in the design, implementation and evaluation of digital education reforms. Under each core consideration, the paper proposes **policy pointers for action** which suggest further practical steps Brazil could take (Table 1).

Table 1. Summary of core considerations and policy pointers for digital education reform in Brazil

Policy process	Core considerations	Policy pointers for action
Policy design	How can Brazil enhance the design of digital education reforms for implementation that has stronger educational purpose and alignment?	1. Adopt a clear shared purpose for digital education reforms
		2. Explore opportunities to enhance and expand collaborative digital education governance
Policy implementation	How can Brazil align and support different actors to ensure that digital education reform efforts achieve their goals?	3. Support comprehensive implementation planning at subnational and school level
		4. Foster learning networks with clear purpose and resources
Policy evaluation	How can Brazil know if digital reform processes are having their desired impact and should be scaled up?	5. Develop a dedicated monitoring and evaluation framework for digital education
		6. Facilitate the dissemination and use of evaluative information to help scale up good practice

Digital education reform in Brazil

Digital education reforms have been a high policy priority in Brazil for several decades. How can these previous reform experiences inform efforts going forward?

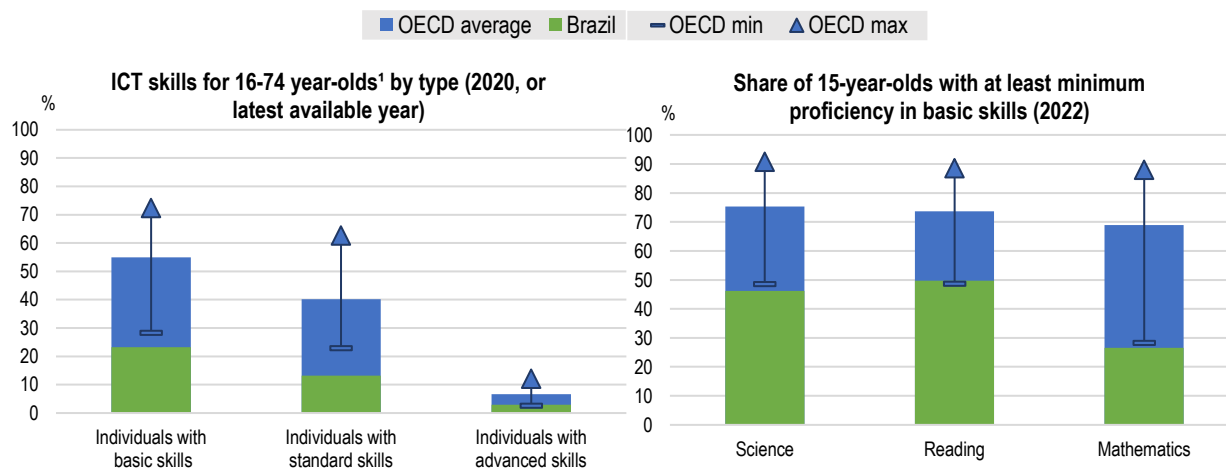
Learners’ digital and foundational skills in Brazil need strengthening

As the global digital transformation marches on, people must be able to confidently navigate digital landscapes to participate fully in social, economic and cultural life (OECD, 2023^[1]). Meanwhile, economies need to equip people with digital skills, as well as foundational and complex competencies, so they can benefit from the productivity and efficiency gains digital technologies offer.

Despite improvements over the last decades, Brazilians of all ages continue to lack the skills required to thrive in a digital society (Figure 1). In 2020, only 23% of 15-74 year-olds in Brazil were able to complete basic digital tasks, such as copying or moving a file and sending e-mails with attachments. This was around half the average share across the OECD. Just 3% demonstrated advanced skills, such as using a specialised programming language (OECD, 2022^[2]). Even prior to the acceleration in digitalisation brought about by the COVID-19 pandemic, information and communications technology (ICT) professionals represented the second largest human resource shortage in Brazil and employers reported difficulties in recruiting people with the necessary technical skills (OECD, 2020^[3]). Among school students too, foundational skills in Brazil require strengthening. In PISA 2022, fewer than one-in-four (24%) students achieved at least minimum proficiency in reading, mathematics and science compared to an OECD average of 61% (OECD, 2023^[4]).

There are also important equity concerns regarding the access to and use of digital technologies in Brazil, which risk replicating or exacerbating pre-existing economic and social inequalities. Digital access and use across households are uneven. While 83% of households nationally had Internet access in 2020, only around two-thirds of those in rural areas or in the most disadvantaged socio-economic bracket did. Similarly, only 17% of rural households and 13% of the most disadvantaged households had access to a computer compared to 61% of households nationally (Brazilian Internet Steering Committee, 2021^[5]). Although Brazil made considerable efforts during the COVID-19 pandemic to widen access to remote learning across disadvantaged populations, at the end of 2021, a black student whose household income was below the equivalent of two minimum wages was three times less likely to have access to a computer connected to the Internet at home than a white student with family income exceeding two minimum wages (Datafolha, 2021^[6]).

Figure 1. Proficiency in skills for the digital age among adults and young people in Brazil



1. For Brazil, data refer to 15-74 year-olds; in most participating OECD countries, the data refer to 16-74 year-olds.

Sources: International Telecommunications Union (2022^[7]), World Telecommunication/ICT Indicators Database, <https://www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx>; OECD (2023^[8]), PISA Database 2022, <https://www.oecd.org/pisa/data/2022database/>.

Persistent and emerging policy priorities for education in Brazil

Raising the quality and equity of skills for the digital age is not the only challenge facing Brazil's education system. For digital education reform to achieve the transformative impact it promises, it will also need to help confront persistent and emerging policy priorities in education. In 2021, the OECD undertook a comprehensive analysis of Brazil's education system (see OECD (2021^[9])). Drawing on desk-based research of national and international evidence, as well as exploratory interviews with education policy stakeholders from across the system, this work highlighted key strengths and policy challenges, in the context of the COVID-19 pandemic. Table 2 summarises some of the identified challenges most relevant to basic education.

Digital technologies have the potential to support Brazil to address these policy priorities. For example, smart technologies can improve educational quality, equity and efficiency through the application of learning analytics or artificial intelligence (AI) to, for example, develop early warning systems for early-school leaving or personalise assessment and feedback processes (OECD, 2021^[10]). Furthermore, digital platforms and learning technologies can enhance teachers' and school leaders' professional development, transforming the delivery of programmes and materials and facilitating connections for peer learning and networking (Mineia-Pic, 2020^[11]). Well-designed digital resource banks can improve the quality of teacher instruction and assessment, and engagement with learning and assessment by students and broader audiences (OECD, 2023^[12]). However, none of this is effectively possible on the ground without carefully designed, implemented and evaluated digital education reforms.

Newer challenges have also emerged in the aftermath of the COVID-19 pandemic. Re-engaging students in their education, supporting their socio-emotional well-being and catching up on learning losses have become key priorities for Brazil, as for many other countries. Digital technologies offer promising solutions here too. Research and policy evidence from large-scale learning recovery programmes indicate that technology-based solutions which incorporate personalised learning opportunities can be particularly impactful (Mineia-Pic, 2023^[13]; OECD, 2020^[14]).

Table 2. Key challenges for basic education in BrazilFindings from *Education Policy Outlook: Brazil 2021 with a focus on national and subnational policies*

Policy level	Policy lever	Key challenges
Students	Equity and quality	<ul style="list-style-type: none"> Increasing the share of students achieving minimum proficiency in the core PISA disciplines. Analysing the intersectionality of inequities to design supports for those with multiple vulnerabilities.
	Preparing students for the future	<ul style="list-style-type: none"> Reducing drop-out and non-completion rates across different programmes and education levels.
Institutions	School improvement	<ul style="list-style-type: none"> Nurturing more positive learning contexts for students to ensure they do not miss out on valuable learning time. Professionalising the school leader role further through enhanced appointment and training processes. Providing quality professional development to teaching staff while making the profession more attractive.
	Evaluation and assessment	<ul style="list-style-type: none"> Supporting educators to engage with monitoring and evaluation data for school and professional improvement that is constructive and does not cause excess stress. Strengthening the use of student assessment to support learning through a more formative focus.
System	Governance	<ul style="list-style-type: none"> Ensuring coherence and alignment across all actors to support more effective and equitable policy implementation. Establishing and promoting vertical and horizontal collaboration structures that support quality improvement.
	Funding	<ul style="list-style-type: none"> Promoting more efficient spending practices by combining outcome indicators, input targets and better monitoring.

Note: This table summarises the identified challenges relevant to pre-primary to lower secondary education only. For strengths and challenges relating specifically to other levels of the education system, see source material.

Source: OECD (2021^[9]), "Education Policy Outlook in Brazil: With a focus on national and subnational policies", *OECD Education Policy Perspectives*, No. 38, OECD Publishing, Paris, <https://doi.org/10.1787/5aa935d9-en>.

Brazil has made important progress in digital education reform

At federal level, Brazil has been undertaking digital education reforms since the 1980s. Early efforts were crucial in securing digital education's place on the policy agenda across government administrations. More recently, efforts have focused on developing holistic approaches that align across education and administration levels and with the wider policy ecosystem.

Digital education reform efforts in Brazil began with a focus on stimulating interdisciplinary research on the use of digital technology in teaching and learning through the *EDUCOM* programme (1985-1991). The next major effort was the *National Program for Informatics in Education* (*ProInfo*, 1997). Phase one (1997-2006) included efforts to institutionalise digital education through state and municipal level institutions and, later, digital technology laboratories in schools. In phase two (2006-17), *ProInfo Integrado* sought to establish a more coherent programme in which the different projects, actions and resources offered to schools aligned more clearly. Through various associated programmes, it also aimed to expand digital access across the school network (Valente and Almeida, 2020^[15]). Brazil also undertook efforts to support teachers over this period. These began as "train the trainer" approaches but with *ProInfo Integrado*, became more comprehensive and eventually reached many more teachers than the original targets foresaw (Valente and Almeida, 2020^[15]).

Brazil's *National Education Plan* (2014), an ambitious consensus-based vision for a better education system, integrates digital technologies into key strategies for raising literacy levels and grade progression with the aim of ensuring comprehensive access to high-speed Internet across the education system and tripling the student-computer ratio by 2024 (Presidência da República, 2014^[16]). Numerous digital infrastructure programmes are in place to meet this target, whether long term or more recent, targeted or comprehensive and under the authority of the Ministry of Education or another body.

In 2017, Brazil introduced a new federal programme to better align these infrastructure actions and other digital education initiatives both vertically and horizontally. The Programme of Innovation Connected

Education (PIEC, 2017) adopts actions across four axes: infrastructure, capacity building, resources and vision (OECD, 2020^[3]). The following year, the federal government launched the Brazilian Digital Transformation Strategy (e-Digital, 2018), an inter-ministerial initiative that integrates federal digital programmes under one whole-of-government framework. In 2021, the policy passed into law with a formalised focus on schools located in socio-economically disadvantaged and/or rural settings (OECD, 2023^[17]).

The National Digital Education Policy (2023) and the National Connected School Strategy (2023) are the most recent efforts to clarify how different programmes, projects and actions articulate across federated entities and government sectors. The former is structured in four axes: 1) digital inclusion of the Brazilian population; 2) ensuring digital education for students and teachers; 3) digital training for the labour market; and 4) encouraging innovation, research, and development. The National Connected School Strategy focuses primarily on strengthening connectivity across the school network enhancing the management and implementation of pre-existing initiatives such as the Cost Monitoring Group for School Connectivity Projects (GAPE, 2021), the Telecommunications Services Universalisation Fund (FUST, 2000) and PIEC. Implementation is overseen by an Executive Committee which brings together representatives from several Ministries and other national bodies and agencies. The legal texts of both policy efforts explicitly call for prioritising the most vulnerable populations or schools and developing accompanying monitoring and evaluation measures (Senado Federal, 2023^[18]; Presidência da República, 2023^[19]).

Alongside these digital education policies, a series of other large-scale reforms aim to embed aspects of digital education across schooling. Digital literacy (digital culture, digital world and computational thinking) is one of ten core transversal competencies outlined in the National Common Curricular Base (BNCC) for basic education (2017). The BNCC acts as a national reference point of essential learnings from which state and municipal curricula and school pedagogical programmes are developed (OECD, 2021^[9]). Further steering documents establishing curricular guidelines for teacher training and professional standards for teachers aligned with the BNCC¹ include references to the digital competencies teachers would need to implement digital literacy, as well as the knowledge of digital pedagogies required to support the safe, responsible and ethical use of ICTs in teaching and learning.

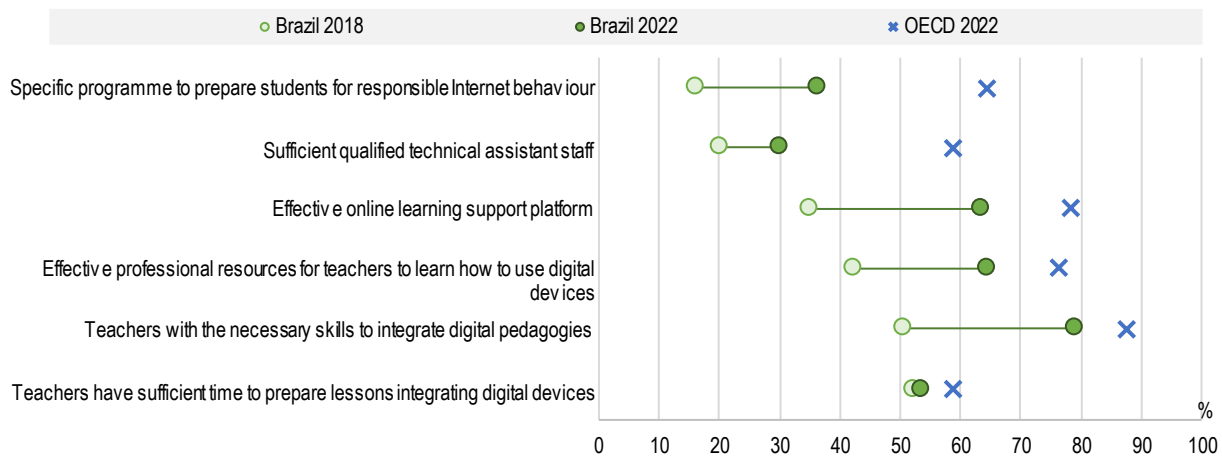
Challenges and opportunities for digital education reforms in Brazil

Despite the numerous policy efforts carried out over several decades, digital education reforms in Brazil have not yet delivered the desired transformative impact on student and school performance. The size and complexity of the Brazilian education system, including with regards to governance arrangements, geography or socio-economic composition, have continued to pose challenges.

Various indicators of school digital preparedness show that Brazil has made considerable improvements particularly during and following the COVID-19 pandemic. Nevertheless, in PISA 2022, school leaders' average perceptions of digital preparedness consistently fell short of OECD averages (Figure 2). Meanwhile, important equity gaps mean that the school leaders of socio-economically advantaged or private schools report a significantly higher level of digital preparedness than their counterparts in disadvantaged or public schools. This can have consequences for student outcomes: in Brazil, a one-unit increase in the index of digital preparedness was associated with a 5-point increase in mathematics performance after accounting for student and school socio-economic profile (OECD, 2023^[20]).

Figure 2. Progress in school digital preparedness in Brazil

Share of 15-year-olds in schools whose principal agreed with the statements, PISA 2018 and 2022



Source: OECD (2019^[21]), PISA Database 2018, <https://www.oecd.org/pisa/data/2018database/>; OECD (2023^[8]), PISA Database 2022, <https://www.oecd.org/pisa/data/2022database/>.

Research and analysis of Brazil’s digital education reform efforts past and present indicate three persistent challenges that are inhibiting greater impact:

- 1. Advancing towards a clear educational purpose at the service of people not technologies.** Previous digital education reforms in Brazil have not typically been built on a critical reflection on the role of digital technology in improving education. As such, the policies have been decontextualized from the daily lives of students and teachers, impeding buy in, ownership and bottom-up innovation (Gonçalves Fernandes et al., 2021^[22]; Brazilian Internet Steering Committee, 2021^[5]).
- 2. Aligning actions across actors and levels:** Previous efforts have varied in logistical and financial support, as well as governance and accountability structures (Valente and Almeida, 2020^[15]). At the same time, the different actions implemented under a single digital education policy have typically been enacted in an isolated manner. This has led to a lack of continuity and collaboration that inhibits both efficiency and impact (Valente and Almeida, 2020^[15]). Moreover, some past reforms have focused on certain aspects of digital education, such as infrastructure expansion, at the expense of others, such as capacity building and research (Brazilian Internet Steering Committee, 2021^[5]). PIEC was designed to balance different aspects of digital education reform. However, infrastructure and digital access again became the focus of early implementation efforts at the expense of teaching and learning centred actions (Gonçalves Fernandes et al., 2021^[22]).
- 3. Transforming practice at scale:** Although Brazil has made considerable progress, efforts to expand digital education infrastructure have consistently underdelivered relative to targets. This is particularly true for hard-to-reach schools, whether in certain geographical regions (north and north-east), rural and remote locations or serving disadvantaged communities. Similar gaps exist for Internet speed and availability of computers but also technology use, particularly in pedagogical matters (Regional Center for Studies on the Development of the Information Society, 2022^[23]). The measures implemented during COVID-19 further exacerbated these inequalities as they rarely took account of pre-existing inequities in digital access and use across the network (Barberia, Cantarelli and Schmalz, 2021^[24]). Finally, the decentralised division of responsibilities in Brazil means there are imbalances and inconsistencies between subnational education systems. This is

particularly notable in the use of education management and information systems to support school improvement (OECD, 2023^[17]).

What can international evidence tell us about digital education reform?

Education systems across the world are pursuing a mutual endeavour: to capitalise on digital opportunities and adequately equip learners for the digital society. With this comes shared challenges despite contextual differences. This section explores some of these challenges, presenting findings from international comparative analysis of policy and empirical evidence across four areas: governance, infrastructure, capacity building and digital resources and learning opportunities.

Enhancing the governance of digital education policy to ensure coherence

People, purpose and process matter for governing resilient and responsive digital education

The early 2020s have highlighted that education systems operate in a world that is constantly evolving towards new equilibria, and that short-term crises may disrupt, accelerate or divert longer-term evolutions. Therefore, governance structures must ensure that education policy consistently pursues its defined goals (responsiveness) and flexibly adapts them as new situations emerge (resilience) (OECD, 2021^[25]).

In matters of digital education, this need to balance the important and the urgent is particularly evident. The transition to a post-industrial, digital society is a long-term trend that countries have been anticipating and preparing for over decades. However, in recent years, short-term shocks such as the COVID-19 pandemic and, more recently, the technological leap achieved with the release of generative AI, have accelerated digitalisation processes and taken them in new, somewhat unexpected directions. In this context, digital education governance must consider how to be more resilient and responsive. Recent OECD work indicates that putting people, purpose and processes at the centre of governance structures can be a promising way forward (Box 2).

International experiences provide a sense of how policy makers can ensure people, purpose and processes become guiding principles for digital education governance:

- **In New South Wales (Australia), the *Schools Digital Strategy (2019)* aims to put people at its centre.** The Strategy is the result of a two-year engagement process with school leaders, teachers and support staff to understand their challenges and reflect together on potential solutions. The “School Digital Strategy Voice of Schools” initiative included extensive consultation and co-creation activities that contributed to the development of the Strategy. The implementation phase has prioritised pilot approaches that allow schools to experiment with tools and processes and provide feedback to inform wider implementation (Annex 1).
- **Chile has established pedagogical innovation as the main purpose of digital education reform.** The Centre for Innovation within Chile’s Ministry of Education aims to strengthen the innovation capacity of the education system. Reflecting this organisationally within the Centre, a team for technological innovation works alongside a much larger team for pedagogical innovation. By institutionalising this approach to digital education reform through the organisational architecture of the Ministry, Chile can help ensure continuity in the vision across government administrations and enhance collaboration with other policy areas (Annex 2).

Across countries, ensuring **continuous evaluative thinking processes in digital education reforms is less developed**. With some exceptions, countries have typically developed policy monitoring and evaluation mechanisms retrospectively, after digital education policies have been designed and implemented (OECD, 2023^[26]). This mirrors wider trends in education policy: in 2020, the OECD found that a culture of policy evaluation is not commonplace across OECD education systems (Golden, 2020^[27]). At

the same time, while enormous effort and investment have been made to reinforce the quality, production and use of education research in policy and practice, the systematic use of research at scale in education policy making remains a challenge (OECD, 2022^[28]). A key barrier has been a tendency to see policy evaluation as a box-ticking exercise at the mid-point or end of a policy process, rather than embedding evaluative thinking as a “way of doing business” at all stages of the policy cycle (Golden, 2020^[27]).

Box 2. The OECD’s *Framework for Responsiveness and Resilience in Education Policy* (2021)

In 2020, the OECD’s Education Policy Outlook began work on a *Framework for Responsiveness and Resilience in Education Policy* to support policy makers to better balance important and urgent challenges in the face of ongoing disruption and change. Designed as a practical tool, the Framework breaks down concepts of responsiveness and resilience across policy levels (students, institutions and systems) and into actionable components. The Framework was developed through analysis of international evidence, as well as an iterative and collaborative process with over 40 participating education systems and other relevant actors.

The Framework highlights three transversal components that help establish a policy ecosystem to nurture resilient and responsiveness at every level. These are as follows:

- **People are at the heart of policy making.** People, their views, interests, capacities and specific resource needs converge at the centre of policy processes. Acknowledging this fact and respecting it in policy making can help restore people’s trust in policy. Policy makers therefore need greater insight into people’s decision-making capacity, their value perception and their relationships with others. People also need to be supported to develop meaningful collaborations in multiple directions – horizontally, top-down and bottom-up.
- **Purpose connects people’s present and future needs.** Through purpose, the people in an education system identify how their individual and mutual priorities interact and the system has a reference standard against which it can distribute resources and assess effectiveness and efficiency. The purpose is shaped by a shared view of common good and informed by foresight and strategic planning. It is defined at two levels: a long-term national or subnational shared vision, and medium- or short-term policy-specific goals or objectives. These must align so that short-term decisions, particularly those taken quickly in emergency contexts, do not constrain long-term options.
- **Processes empower people to achieve the purpose.** Responsive and resilient processes entail continuous evaluative thinking to identify what is working and what needs modification. These processes should be matched with transparent reporting that can help people across the system remain evidence-informed and address information gaps as and when uncertainty emerges.

Source: OECD (2021^[25]), *Education Policy Outlook 2021: Shaping Responsive and Resilient Education in a Changing World*, OECD Publishing, Paris, <https://doi.org/10.1787/75e40a16-en>.

A coherent, co-ordinated strategic vision as the driver for enacting digital education reform

Beyond following the guiding principles of people, purpose and process, in today’s increasingly complex systems, education policy makers must ensure that governance structures enhance policy coherence, alignment and consistency across administrative levels to facilitate effective policy planning and delivery.

This can include setting system objectives and priorities, refining formal structures, responsibilities and roles and engaging stakeholders at different moments in the policy cycle (OECD, 2019^[29]).

Analysis of governance-related reforms in education has identified that good practices include breaking down long-term national goals into shorter term actions and sub-actions with concrete outputs that can be continuously monitored and evaluated. In addition, seeking synergies across policy areas ensures that complementary efforts can facilitate stakeholder buy-in and local-level implementation (OECD, 2019^[29]).

Regarding digital education specifically, governance takes on further complexity. While decision-making responsibilities for digital education reform tend to follow those of wider areas of education, a plethora of actors at central and sub-central level, within and beyond the education sector typically participate in the implementation. Furthermore, as countries increasingly develop whole-of-government digital strategies, the education sector must ensure it collaborates effectively with other government sectors whilst protecting and promoting education-specific actions. Meanwhile the spread of innovation and development in digital technologies, and the rapid expansion of the education technology industry (EdTech), means governance structures must be flexible enough to adapt to a constantly changing landscape.

The recent OECD project on *Resourcing School Education for the Digital Age: Effective Digitalisation and Future-Ready Teachers* is supporting education systems to navigate this complexity in ways that can make effective use of digital technologies to enhance quality, equity and efficiency in education. The project has developed a framework to assess digital education policies along eight analytical dimensions. At the head of this framework is the need for a coherent and co-ordinated strategic vision for policy co-ordination. Such a strategy, if accompanied with concrete implementation instruments including funding provisions, regulatory frameworks and monitoring and evaluation mechanisms, can support greater efficiency by helping policy makers to better target resources to needs and ensure policies have complementary effects (OECD, 2023^[26]).

However, across OECD countries, this type of good practice is not consistently in place. Research into education responses to COVID-19 indicate that in many countries digital education efforts were inhibited by a lack of strategic clarity, leadership and coordination among actors (Vincent-Lancrin, Cobo Romani and Reimers, 2022^[30]). OECD analysis prior to the pandemic highlighted that existing digital policy strategies across OECD education systems often lack sufficient detail and depth. In 2020, only half of OECD countries had adopted a specific digital education strategy as opposed to generic national digitalisation strategies and, of those in place, most had no budget nor implementation plan and rarely detailed specific technologies (van der Vlies, 2020^[31]). Since COVID-19, although education systems have typically updated their existing strategies there has not been a clear increase in the level of specificity (OECD, 2023^[26]). In Brazil, the recent introduction of the National Connected School Strategy creates an important opportunity to develop robust and comprehensive implementation instruments that promote coordinated actions aligned with the Strategy's goals across school networks.

Some countries can offer examples as to how such good practice can be achieved:

- [Ireland's Digital Strategy for Schools to 2027](#) is accompanied by implementation action plans overseen by a dedicated Steering Group. The first Plan covers 2022-2024. Annual progress reports will feed into an interim review at the end of this first phase which will in turn inform the next Plan for 2025-2027. The Steering Group oversees and provides guidance on implementation. The Group includes representatives from the Department of Education and key government agencies responsible for school inspection, curriculum and professional development (Department of Education Ireland, 2022^[32]) (Annex 4).

Expanding and maintaining infrastructure and resources to compensate and not exacerbate inequities

Universal access to adequate digital infrastructure across the education system is a pre-requisite to enhancing digital skills and promoting digital innovation. It is also now considered part of the right to education (Global Education Monitoring Report Team, 2023^[33]).

The availability of digital equipment may also be a factor in improving student performance: PISA 2022 results indicate that higher performing systems ensure every student has access to a digital device. Furthermore, as the number of devices to students approaches 1:1, school leaders are less inclined to perceive that a lack of digital resources hinders their school's capacity to provide instruction (Figure 3). In Brazil, a one-unit increase in the number of computers available in school per student was associated with a 17-point increase in mathematics performance after accounting for student and school socio-economic profile (OECD, 2023^[20]).

Basic digital infrastructure for schools includes adequate Internet connection, speed and bandwidth as well as devices for teachers and students. Increasingly, it also includes management information systems, virtual learning environments and education software or learning applications. As the number of components of adequate digital infrastructure increases, so too does the need for interoperability to enable two or more systems to exchange and use shared information (see Chapter 11 in OECD (2023^[34]) for information regarding related efforts by OECD education systems).

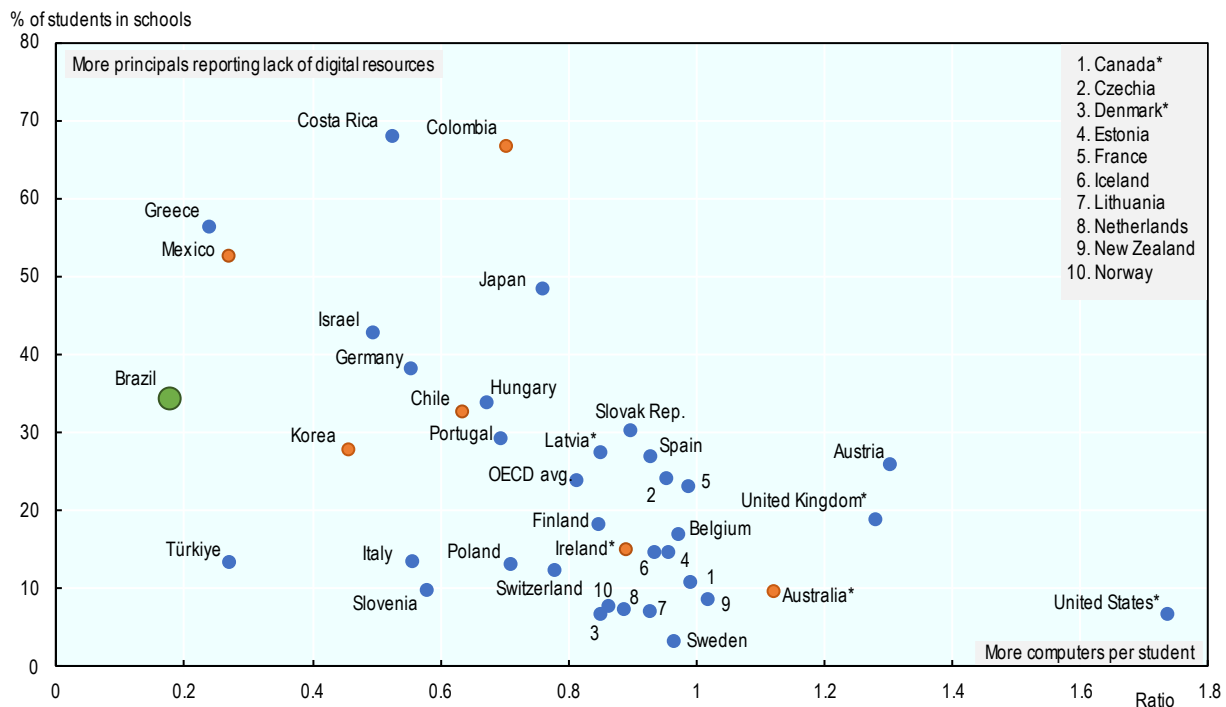
Countries have different approaches to providing digital equipment and infrastructure. Globally, commitments to ensuring connectivity are widespread while efforts to provide devices are more disparate. While over four-fifths of countries have legislation or policies for improving school or learner connectivity and around two-fifths have legislated for universal Internet provision, only around one-fifth has a policy granting subsidies or deductions to students or families to buy devices and even fewer provide a device for every student or family (Global Education Monitoring Report Team, 2023^[33]). Some countries leave procurement to local or school-level administrators while in others, all related decisions are made by the central authorities (OECD, 2023^[26]).

Evidence regarding these different approaches does not clearly indicate the benefits of one over the other although, without careful implementation, certain approaches have the potential to increase inequities. For example, expansion strategies that rely heavily on “Bring Your Own Device” programmes can widen gaps between students as those who have no personal device or have a lower quality device cannot benefit to the same extent as their peers (van der Vlies, 2020^[31]). Similarly, “technology worship” approaches such as those that distribute a device to every student require significant investment and can lack impact as they may overlook the human and social elements of learning (Vincent-Lancrin, Cobo Romani and Reimers, 2022^[30]). Establishing partnerships either between educational institutions or with the private sector is essential in mobilising resources but governments will also need to reflect upon what should form the core of open digital resources for all and what should be accessed privately (Vincent-Lancrin, Cobo Romani and Reimers, 2022^[30]; OECD, 2021^[10]).

Ensuring quality and equitable digital education infrastructure is not a one-time effort; it entails maintaining the quality of resources over time (OECD, 2023^[26]). This task tends to fall to subnational authorities or schools themselves, often through technical teams or dedicated ICT technicians. For many education systems, key challenges in resourcing and implementing digital education infrastructure reforms have come from underestimating or overlooking this crucial task with inadequate capacity building or funding (Global Education Monitoring Report Team, 2023^[33]).

Figure 3. Digital infrastructure in schools across OECD education systems

Number of computers available for students in schools and school leaders' perceptions of digital resources (2022)



*Caution is required when interpreting estimates for these countries or economies because one or more PISA sampling standards were not met. Source: OECD (2023^[33]), *PISA Database 2022*, <https://www.oecd.org/pisa/data/2022database/>.

It is therefore not so much the specific infrastructure delivery model that matters as it is the way in which this model is implemented and the attention it pays to equity over the long term. Combined approaches for different target groups and over different timeframes may be a promising way forward, as seen in some international experiences:

- **New South Wales (Australia)** has prioritised targeted measures for rural and remote communities. The *Rural Access Gap* is a priority action of the *Schools Digital Strategy*, providing over 1 000 rural and remote schools with higher quality and more stable Internet connectivity, portable devices for teachers and associated support and training. Related actions were undertaken in the first implementation phase of the Strategy as part of a partnership between the New South Wales Government and Telstra, Australia’s largest broadband provider. Recognising the unique needs of each school, the Department for Education has developed specific technological solutions for rural and remote schools and provided funding for a school-appointed Digital Classroom Officer in these schools (NSW Department for Education, 2023^[35]) (Annex 1).
- **Chile** has previously focused on equipping students with their own devices, first prioritising the most disadvantaged. The *I Choose my PC* programme (2011) provided all disadvantaged or vulnerable students in the final year of primary school who showed promising academic performance with a personal laptop. The *I Connect to Learn* programme (2015) extended this to reach all students in this grade also providing one year of free connectivity. As such, currently, all students from the end of primary school to the end of upper secondary school have their own device (Claro et al., 2022^[36]) (Annex 2).

Beyond standard or traditional digital equipment, education systems increasingly have access to a range of more advanced digital tools and products developed by EdTech companies. This can include adaptive technologies that help personalise learning, smart technologies that help detect, diagnose and act on learning challenges, digital assistive technologies that support students with special needs and even robots that can act as classroom assistants. Beyond a direct impact on student learning, smart technologies and AI solutions can enhance education management at institution and system level.

However, there is a wide gap between the technology available to most education stakeholders and the most advanced, forward-looking technologies (Vincent-Lancrin, Cobo Romani and Reimers, 2022^[30]). In part, this is because applications remain experimental, high-cost and have varying degrees of accuracy (OECD, 2021^[10]). At the same time, too often the appeal of new technology clouds judgement regarding its pedagogical value (Global Education Monitoring Report Team, 2023^[33]). This implies there is work to do within the EdTech sector to build a stronger evidence base for the educational cost-benefits of new technologies, and to communicate these to educators and policy makers. It also means that forward-looking education systems seeking to leverage the full capability of digital technologies need to consider how to create an environment that is more conducive to embracing and driving digital innovation.

One way forward is to steer EdTech actors to better serve education goals and the public good. Providing opportunities for collaboration between educators, policy makers and EdTech developers can ensure new innovations address stakeholders' needs (OECD, 2023^[26]). By implementing procurement guidance and quality assurance processes, governments can also encourage the private sector to better demonstrate and communicate the effectiveness of their products.

Related policy efforts are nascent across OECD countries:

- **Korea has progressively been introducing advanced technologies to the education system.** Most recently, Korea has established a network of Teachers who Upgrade Classes with High tech (TOUCH) teachers and AI pilot schools. These teachers and schools, drawn from those that already embed digital technologies in their work, will be supported to develop the knowledge, skills and infrastructure needed to take advantage of emerging technologies to better personalise students' learning. As of 2023, Korea has also established three Edtech Soft Labs to support collaboration between the Edtech sector, researchers and educators (Ministry of Education Korea, 2023^[37]) (Annex 5).

Supporting educators to develop digital competencies to enhance teaching and learning

To ensure that digital technologies can deliver on their transformative potential for student outcomes, education systems need to develop educators' and schools' integration of digital tools into everyday teaching contexts. Digitally confident teachers are better placed to help their students acquire digital skills and to take advantage of new technologies to reduce their administrative workload and enhance their teaching. Meanwhile, school leaders that can drive whole-school development and promote digital and innovative school cultures are crucial to school digital transformation.

However, results from TALIS 2018 show that many teachers felt unprepared for using technology in their teaching before the COVID-19 pandemic. Across the OECD, only 56% of participating teachers reported having received initial training in this area, and just 43% felt well-prepared by such training (OECD, 2019^[38]). Although the experience of remote learning during COVID-19 is likely to have increased teachers' skills and confidence in many countries, it has also increased expectations around how teachers and schools should be embedding technology in their practice. Moreover, digital innovations over the same period mean educators are interacting with an ever-changing digital landscape.

Previous research indicates that school leaders have often been neglected when it comes to policy efforts to enhance capacity, despite their crucial role as leaders of change (OECD, 2019^[29]). Only some education systems have sought to strengthen the digital capacity of schools by investing directly in the professional

development of school leaders: just one-third of European education systems explicitly stated this as part of their strategic objectives in 2019 (OECD, 2023^[26]).

Nevertheless, policy and empirical evidence offers valuable insights into what works to build capacity for the impactful integration of digital technologies into educators’ practices. Research undertaken by the Education Policy Outlook of successful policies to support teachers and school leaders both during and prior to the COVID-19 pandemic produced three key lessons: 1) position educators to become the drivers of their own learning; 2) provide educators with tools that are responsive to their specific needs and contexts; 3) foster collaborative relationships among educators for double impact on professional development and educator resilience (OECD, 2020^[14]).

More recently, the OECD’s project on *Resourcing School Education for the Digital Age: Effective Digitalisation and Future-Ready Teachers* identified two policy levers for supporting educators to transform their practice through digital technologies: capacity building and human resource frameworks. Within both these areas, the project has proposed good practices that can be grouped under two key aims: providing supports (top-down) and empowering educators to support themselves (bottom-up) (Table 3).

Table 3. Promising approaches to strengthening teachers’ and school leaders’ use of technology

	Capacity building	Human resource frameworks
Provide support to teachers and school leaders	Further integrate capacity building for the effective use of digital education technology into initial training for educators	Build sufficient technical and specialist support structures for educators and students using digital technologies for teaching and learning
	Create organisations that focus on professional learning, including digital capacity building	
	Explore the potential benefits of providing central guidance for institutions	
	Invest in the capacity of school leadership	
	Monitor and address equity issues related to digital capacity in schools	
Empower teachers and school leaders to support themselves	Ensure that educators have access to relevant and impactful opportunities for continuing professional learning	Review working time and staff arrangements in education institutions to make time and space for digital education
	Encourage or directly support the creation of peer-learning opportunities, including communities of practice	Design incentive mechanisms and career reward structures to encourage teachers’ engagement in digital education
	Support institutions to build a strong culture of digital education	
	Support institutions’ efforts to self-evaluate their digital capacity and their development of digital education strategies	

Source: Adapted from OECD (2023^[26]), *Shaping Digital Education: Enabling Factors for Quality, Equity and Efficiency*, OECD Publishing, Paris, <https://doi.org/10.1787/bac4dc9f-en>.

Currently, capacity building approaches appear more common than human resource approaches: educators across OECD countries are given little dedicated time and incentives to enhance their pedagogies through digital technologies and also record a severe lack in technical support staff (OECD, 2023^[26]). Nevertheless, international experiences provide some practical examples:

- **New South Wales (Australia)** has funded a dedicated staff member in every rural or remote school to support the implementation of the *Schools Digital Strategy*. A key strength of the Rural Access Gap has been the Digital Classroom Officer program which creates the opportunity for a teacher in each participating school to take on extra responsibilities to support colleagues to embed technology in their daily practice. To balance this, the Department of Education provided school-level funding that enabled a reduction in their teaching timetable and other measures. The Officers follow a tailored professional development programme with ongoing mentoring (NSW Department of Education, 2023^[39]) (Annex 1).

- **Korea** has introduced initiatives to promote self-directed learning among educators. The *Knowledge Spring* (2020), a personalised teacher training platform, allows users to select content and resources based on their identified needs, with expert teachers providing the learning resources. It also promotes collaboration between teachers across the country (OECD, 2021^[25]). (Annex 5).

Providing quality digital education resources and digital learning opportunities

For many years, the promise of online learning and digital education resources to address inequities and expand access to education has inspired education policy makers. Technology can foster more equal access to education content by facilitating the creation, adaptation and sharing of resources, expanding storage, distribution and management possibilities and reducing costs, at least in the long term (Global Education Monitoring Report Team, 2023^[33]).

Online learning and digital education resources include learning platforms or learning management systems (i.e. an integrated set of resources, tools and online services for teachers and learners within a course structure); digital libraries and repositories; digital textbooks and ebooks; interactive learning software and games; and digital curricula. These can be designed and provided by educational authorities, by non-governmental actors as open resources for public use, or by commercial actors.

However, the opportunities offered by new digital resources come with implementation challenges. The sheer quantity of available resources and the decentralised nature of their production make it hard for educators, learners and families to make decisions about what best meets their needs. It also complicates system-level quality assurance. At the same time, school curricula, which are typically static, linear and standardised, do not always easily accommodate digital learning opportunities and resources (OECD, 2023^[26]). This can help explain why technological initiatives are more likely to reinforce existing pedagogical approaches than reframe them (OECD, 2020^[40]).

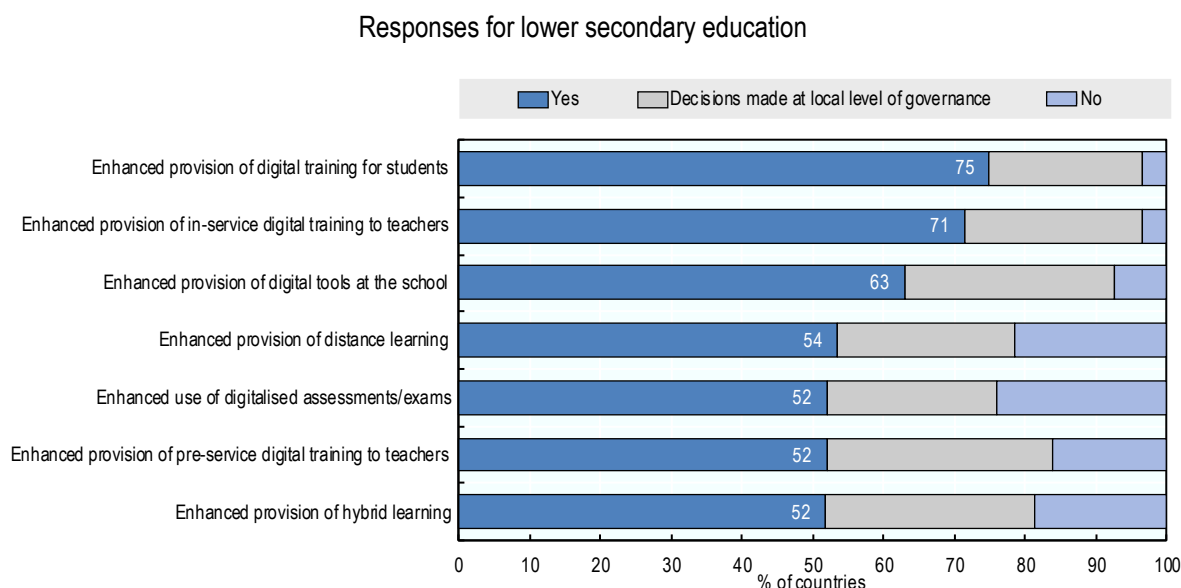
Prior to the COVID-19 pandemic, efforts to embed digital learning content and resources in formal schooling were nascent. International classroom evidence indicated that teachers rarely used digital content in innovative ways or allowed students to proactively use it (OECD, 2020^[41]). At the same time, most countries' efforts to digitalise curricula were limited to producing electronic or online versions of curricular documentation (OECD, 2020^[42]). Furthermore, many education systems had tight regulations concerning remote or online delivery of formal education (OECD, 2020^[42]).

The COVID-19 pandemic may prove to have been a watershed moment. During the emergency shift to remote education in 2020, digital learning resources powered educational continuity. When surveyed in 2022, 17 out of 27 participating OECD countries reported planning to continue the enhanced use of digital tools in lower secondary education while even more reported continuing the enhanced provision of distance or hybrid learning for students and teachers (Figure 4). Nevertheless, while several countries did introduce changes to their regulatory or institutional frameworks during the pandemic, only four had plans for further changes in 2022 (OECD, 2022^[2]).

As education systems look to enhance and extend their use of digital education resources and content, OECD analysis reveals several considerations for policy makers. Reflecting on experiences during the pandemic, education systems should look beyond a binary delivery model (online or in-person) to consider a wider spectrum of teaching and learning modes which integrate an array of digital and real-world settings and tools that put people and their needs at the centre (OECD, 2020^[14]). This has implications for curricula and assessment design. Furthermore, when developing digital resources or learning platforms, rapid prototyping paired with continuous monitoring, evaluation and improvements can foster greater quality (Vincent-Lancrin, Cobo Romaní and Reimers, 2022^[30]). Recent research into digital resource banks emphasises that such work should be done in collaboration with end-users (i.e. educators, students and parents) (OECD, 2023^[12]). Finally, schools and teachers need support in selecting resources that meet

their needs, for example through the work of clearinghouses or certification mechanisms, through greater collaboration with the EdTech sector or through sharing good practices and peer learning (OECD, 2023^[26]).

Figure 4. Share of countries planning to maintain or develop digital measures implemented during COVID-19



Note: See source material for notes.

Source: OECD (2022^[21]), *Education at a Glance 2022: OECD Indicators*, OECD Publishing, Paris, <https://doi.org/10.1787/3197152b-en>.

Some countries are implementing related actions:

- In recent years, **Mexico** has developed an extensive, multi-modal programme of digital content to strengthen, supplement and, where necessary, replace in-person schooling. “@prende.mx” is the department within the Ministry of Public Education responsible for digital education policy. It oversees, maintains and develops four key platforms: 1) *Edusat web*, an online educational television network with 13 channels; 2) *MéxicoX*, which offers free online courses and training for learners of all ages; 3) the *New Mexican School – Digital* platform, which brings together thousands of digital resources and textbooks aligned to the curriculum; 4) *Learn at home*, a platform to support remote learning (Annex 6).

Core considerations

The rest of this Education Policy Perspective proposes core considerations and policy pointers for policy makers in Brazil with regards to the design, implementation and evaluation of digital education reforms. Informed by the key challenges in Brazil identified in the first section, they aim to support Brazil to pursue policy processes that prioritise a clear education purpose, ensure alignment and synergies across different actors and seek to transform practice at scale. Building on the international good practices identified in the second section, the pointers cover aspects related to coherent digital education governance, the equitable expansion of quality digital infrastructure, capacity building for educators and the development and deployment of digital education resources. They are also shaped by the discussions during the *Policy Dialogues in Focus* seminars.

How can Brazil enhance the design of digital education reforms for implementation that has stronger educational purpose and alignment?

This section explores **policy design** elements of digital education reform in Brazil. A well-designed policy is clearly justified and offers a logical and feasible solution to the policy problem. Ideally, it is built on solid knowledge of the education system, the wider context and international evidence of what has worked elsewhere (Viennet and Pont, 2017^[43]). This core consideration offers two key policy pointers to help policy makers address key challenges in a purposeful and well-aligned manner: 1) adopting a clear shared vision for digital education reform and 2) enhancing and expanding collaborative governance.

Adopt a clear shared purpose for enacting digital education reforms

In today's interconnected and fast-changing world, effective governance requires going beyond traditional "piecemeal" and "input-output" approaches. Instead, a systems-thinking approach requires governments to formulate an adequate definition of the purpose and objectives of envisaged policy change. This means using "stewardship", or transformative leadership, to provide a shared strategic vision of the desired changes and to steer and monitor the implementation of proposed reforms (OECD, 2017^[44]; OECD, 2019^[29]).

As described above, in Brazil, a lack of shared strategic purpose for digital education has led to isolated and overlapping actions. When overarching visions have been established, such as with the development of PIEC, a more holistic strategy has been difficult to sustain throughout the policy cycle and across implementation levels. This has allowed instrumental approaches to digital education reform, such as those focused on providing equipment to schools, to dominate (Valente and Almeida, 2020^[15]; Gonçalves Fernandes et al., 2021^[22]). In contrast, leading with a strong strategic purpose can foster more transformative action focused on changing educational practices through technological capacity.

The introduction of the National Digital Education Policy (2023) and National Connected School Strategy (2023) are important steps to establishing a clearer national vision. However, Brazil has more work to do to ensure that they effectively engage actors to establish a shared interpretation of how the vision will be implemented. Part of this will be to agree a shared sense of purpose that can sit at the core of all related implementation efforts.

Policy pointers: There are various key challenges for Brazil's education system that could be addressed together through the core of a shared purpose. This includes increasing equity in learning outcomes, enhancing foundational skills for all, supporting curricular implementation or transforming teaching and learning. Among these options, and others, there is no right or wrong area of focus; rather:

- 1. Purpose needs consensus and clarity:** It is important that the purpose is determined through comprehensive consultation with a broad group of stakeholders (Box 3). The purpose – and how it will be realised - also needs to be clearly defined. This includes actionable goals and ambitions that are both measurable and fully capture the complexity of the challenge without oversimplifying it into something quantifiable.
- 2. Purpose needs accountability:** Part of policy leadership requires holding actors across the system to account for delivering on the purpose. This could include introducing guidance to subnational and institutional actors on how to address the shared purpose in implementation strategies and action plans or requirements that oblige policy actors to periodically and systematically report their efforts to address the purpose. It could also involve incentivising purpose-driven implementation efforts by recognising good practices or establishing conditions for the delivery of resources.

Box 3. A collaborative approach to establishing a shared vision in New South Wales (Australia)

The New South Wales Department of Education engaged in a two-year development process for the *Schools Digital Strategy* (2019). This included extensive engagement with key stakeholders, both school- and administration-based.

For school stakeholders, the Department undertook broad canvassing to determine the different opportunities digital technologies might offer schools, as perceived by educators. The Department also ran design-thinking sessions in which stakeholders worked together to create different possible actions for the Strategy. Finally, schools were encouraged to provide feedback and validation on the draft Strategy. The findings are documented through videos and reports published on the Department's website, ensuring they remain front and centre as the Strategy is implemented.

Based on the stakeholder engagement and wider research, the Department identified five key considerations that have informed the Strategy's design and implementation:

- Schools are best placed to take charge of their own digital journey.
- Teachers' digital literacy is critical in improving digital maturity and the learning experience.
- The Department is best placed to support schools and provide perspectives for innovation.
- Real-time feedback and collaboration in schools/classrooms will improve student outcomes.
- The digital playing field needs to be levelled across the state.

These collaborative efforts have been seen to increase buy-in across schools and avoid reform fatigue.

Source: NSW Department of Education (2019^[45]), *Leading education in a digital world: Schools Digital Strategy handbook 2019-2026*; Marrone et al. (2021^[46]), *Digital technology in education systems around the world: Practices and policies*.

Explore opportunities to enhance and expand collaborative digital education governance

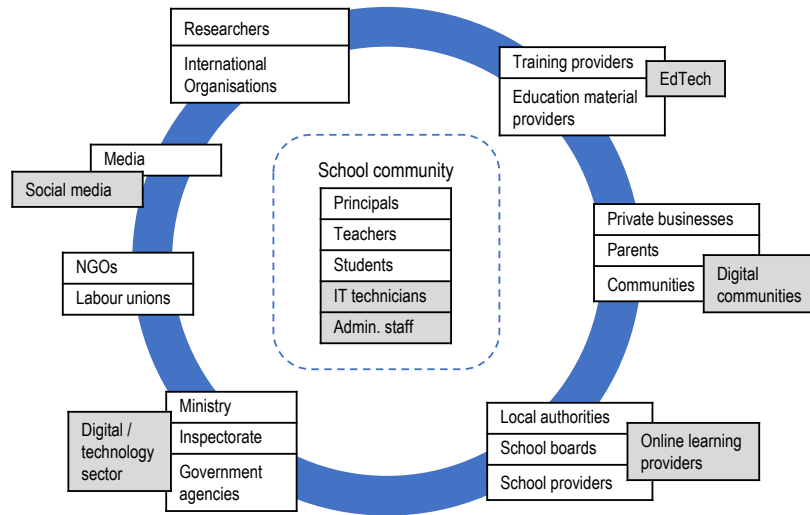
Today's societies display increasing complexity. Yet with complexity comes great opportunity: by collaborating with the wide range of stakeholders engaged in education, policy makers can take advantage of new voices, ideas and synergies, combine resources towards a shared purpose; and understand and address policy problems more comprehensively (OECD, 2019^[29]). Collaborative governance processes are key to capitalising on these opportunities but national and subnational governments see implementing such processes as a major challenge (OECD, 2020^[47]).

Collaborative governance complements rather than replaces existing policy structures. It enables priority policy processes to exist at the interface between public, private, non-profit and civil society. Structures for collaborative governance include roundtables, working groups and committees, consultative bodies, stewardship councils and consortia. These can exist at different layers of education governance benefitting policy making at national, local and regional levels.

Involving and co-ordinating all concerned government actors and non-governmental stakeholders is a key function of governance and is critical for comprehensive and successful policymaking (Gierten and Leshner, 2022^[48]). There is thus a need for governance mechanisms that include all stakeholders and voices in the governance process and not only the most vocal or technologically savvy (Burns and Köster, 2016^[49]). In modern education systems, stakeholders have grown in diversity and become increasingly invested in how education systems function and what they provide students (Figure 5). For example, in digital education specifically, private business has played a crucial role in driving technological innovation. While the media traditionally helps hold education systems to account, in digital education policy, the media can also act as

an important venue of professional development for educators through social media networks. At school level, technical and administrative staff play a larger role as digital education policies become a central feature of their work too.

Figure 5. Stakeholders involved in (digital) education policy processes



Note: Shaded boxes indicate additional or specific stakeholders for digital education processes.

Source: Adapted from Burns, T. and F. Köster (eds.) (2016^[49]), *Governing Education in a Complex World*, Centre for Educational Research and Innovation, OECD Publishing, Paris, <https://doi.org/10.1787/9789264255364-en>.

In many ways, the allocation of roles and responsibilities across Brazil’s education system means that collaboration and coordination are embedded in governance structures. Brazil stands out as an exception among federal countries with a more prominent role played by municipalities that often rely on non-state actors from the private sector and civil society to help provide social services. Brazil also has a high degree of local autonomy and no hierarchical relationship between state governments and municipalities (OECD, 2020^[47]). However, while Brazil is a highly decentralised country, in practice, the autonomy of state and local governments in education is somewhat limited by a rigid fiscal system, frequent overlap of responsibilities and tendency by central government to enact top-down policies (OECD, 2020^[47]). This proved successful in the expansion of education provision and participation in the early 2000s. However, improving quality and equity requires more locally responsive and innovative policy making.

Policy pointers: To foster greater responsiveness and innovation through collaborative digital education governance, Brazil can seek to:

1. **Strengthen existing multi-level governance structures.** Several structures already exist within Brazil’s education system to support multi-level governance to facilitate the delivery of digital education. Strengthening these to ensure they fully meet their purpose and deliver on matters related to digital education is a first step in enhancing collaborative governance. This requires understanding the ways in which these structures do or do not support collaborative governance, then co-developing actions to overcome identified problems and weaknesses.

The OECD has previously developed a set of recommendations for Brazil’s supreme audit institutions to assess multi-level governance (Box 4). This framework can be adapted and applied to digital education governance to help develop a more comprehensive understanding of the governance landscape. This audit could lead to a set of recommendations to strengthen multi-level governance for the implementation of the National Digital Education Policy in the next years.

Box 4. Auditing decentralised policies in Brazil: Collaborative and evidence-based approaches

In 2020, the OECD published a generic multi-level governance assessment framework for Brazil to support oversight institutions within central government to make decentralised policies more effective and coherent. The framework covers six dimensions:

- 1) assignment of responsibilities;
- 2) funding of subnational responsibilities;
- 3) current capacities of subnational governments and capacity building;
- 4) co-ordination among levels of government;
- 5) performance monitoring and transparency;
- 6) fiscal equalisation systems and regional policies to reduce territorial disparities.

In the same report, the OECD developed a specific framework for assessing multi-level governance in education in Brazil, including a methodology, questions and indicators to define maturity levels for each of these dimensions.

Source: OECD (2020^[47]), *Auditing Decentralised Policies in Brazil: Collaborative and Evidence-Based Approaches for Better Outcomes*, OECD Public Governance Reviews, OECD Publishing, Paris, <https://doi.org/10.1787/30023307-en>.

2. **Establish stronger and broader collaborative governance mechanisms.** Although the audit described above was initially designed for formal institutions, such processes are typically slow and bureaucratic. For the sake of diagnosing multi-level governance in digital education in a way that will provide more immediate feedback to strengthen governance, the framework could be adapted and used by **a more dynamic and inclusive body, representative of the different stakeholders involved in digital education**. This body could be established with the specific purpose of conducting the audit or could take on a wider role in supporting the implementation of digital education policy. Many of the subsequent policy pointers proposed here could be put into action by a multi-stakeholder body of this nature.

Efforts to strengthen collaborative governance for digital education should also include **reflection on how digital education matters are covered within existing national participation spheres**. In Brazil, such spheres include national conferences (e.g. the National Conference on Education), participatory forums (e.g. the National Education Forum), collegiate bodies (e.g. the National Council of State Education Secretaries) and intergovernmental commissions. These mechanisms include subnational governments, as well as civil society, unions and universities. Some have decision-making powers while others are for dialogue and consensus building (OECD, 2020^[47]). There may be scope to enhance work on digital education through these bodies by formalising and systematising their efforts in this area, for example through dedicated working groups or committees. At the same time, given the wider group of stakeholders involved in digital education it may be necessary to establish a new sphere for collaboration in this area.

Finally, Brazil could also reflect on the need to develop more **formal and informal structures for collaborative governance in digital education at subnational and institutional level**. While ultimately such decisions will be made by authorities at the respective levels, the federal government could provide support in this area through guidance material, knowledge sharing and capacity building on related matters. Education Development Arrangements (2012) and municipal consortia (see OECD (2021^[9])) offer interesting models for collaboration which Brazil could expand

into the digital education sphere. These structures support municipalities to work together by, for example, undertaking intermunicipal procurement processes or building multi-stakeholder coalitions to drive transformation locally.

How can Brazil align and support different actors to ensure that digital education reform efforts achieve their goals?

As in any policy process, excellent design is not enough—a realistic and empathetic estimation of **policy implementation** costs and benefits, as well as an awareness of how to manage the political economy of digital education reform are also crucial (Viennet and Pont, 2017^[43]). In Brazil, digital education implementation efforts can be supported by facilitating a comprehensive, multi-level and transparent planning effort, and fostering dynamic knowledge-sharing and peer-learning networks between and across different sets of actors. The rest of this section explores each of these approaches in more detail.

Support comprehensive implementation planning at the subnational and school levels

Previous analysis by the OECD concluded that three key factors can inhibit the successful implementation of education reforms. These are 1) a lack of focus on implementation processes and actions when defining policies at system level; 2) a lack of recognition that change processes require engaging people; 3) a lack of understanding that implementation plans need to adapt to changing circumstances (Viennet and Pont, 2017^[43]). Careful implementation planning across the education system can help avoid these mistakes.

In previous large-scale education reforms in Brazil, implementation processes have not always sufficiently translated the goals of policy design into concrete action and results. In Brazil's decentralised system, implementation planning must occur at multiple levels: federal, state, municipal and school. In addition, given the multitude of benefits and risks that digital technologies bring, implementation planning for digital education reform must empower all education actors and draw upon a range of expertise (OECD, 2022^[50]).

The current context in which Brazil is implementing several large-scale reforms at once, such as the BNCC, the New Upper Secondary reform and the Common National Bases and Guidelines for teacher training, makes careful implementation all the more crucial as federal, subnational and school actors need to effectively balance resources across reform efforts and ensure alignment.

Policy pointers: Brazil could take several actions to support and steer implementation planning in subnational administrations and schools. These can draw on similar experiences in other education systems (Box 5). Possible actions include:

- 1. Introducing requirements for implementation planning and reporting.** Just as has been done for the introduction of the BNCC, the federal government could make implementation planning a condition for the transfer of funds for digital education reforms to subnational authorities. Subnational actors could also be required to report their implementation progress regularly, using the planning documents as benchmarks. Synthesising these reports into an annual national report would also be good practice, as would making them publicly available to allow for peer learning, horizontal accountability and comparative analysis.
- 2. Providing capacity building opportunities.** To support the implementation of the BNCC at subnational level, the federal government has delivered financial and technical support by funding staff (curriculum writers, co-ordinators and staff dedicated to strengthening collaboration between states and municipalities) and training administrators (OECD, 2021^[9]). These supports are comprehensive and could be considered for the implementation of the National Digital Education Policy. There are also less resource intensive options. Brazil could undertake pilot programmes through which some priority states, municipalities and schools are supported more intensively, initially. Their experiences can then inform an evidence-based capacity building programme that

can be delivered nationally as implementation expands in scope. Participants in the pilots can also become a valuable resource in supporting capacity building among peers.

Box 5. Supporting implementation planning of digital education reforms in Colombia and Ireland

Capacity building for regional implementation planning in Colombia

In 2020, **Colombia** launched the *Technologies to learn: National policy to promote innovation in practices education through digital technologies*. To support implementation and foster a national ecosystem of educational innovation, the Ministry of National Education now requires regional education authorities to develop *Territorial Education Innovation Plans*. Meanwhile, the Ministry has intensified the technical support offered to territorial authorities for educational innovation. This includes developing guidelines and tools, establishing online meeting spaces and publishing a set of recommendations for the formulation of the Plans. These recommendations build on the outcomes of an earlier research collaboration between the EAFIT University and the Secretariats of Education of Itagüí and Bogotá.

Providing tools for school implementation planning in Ireland

As part of the *Digital Strategy for Schools 2015-20*, schools in Ireland were required to develop a *Digital Learning Plan* to articulate the school's vision for the use of digital learning technologies. The Plan outlines the school's current situation and describes how digital learning practices will be improved over a specific time period with associated measurable targets. Ireland developed a range of tools and resources to support schools with implementation planning. The *Digital Learning Framework (2017)* acts as a roadmap, providing descriptors of digital competence for teachers, school leaders and schools at effective and highly-effective levels. Various guidelines and supporting resources are centralised on a website dedicated to digital learning planning. Ireland's Professional Development Service for Teachers provides schools with related professional learning opportunities and, on request, hands-on practical support in schools.

An evaluation of the *Digital Strategy for Schools 2015* highlighted that this planning process and the related supports have been critical in enabling schools to implement real change. The evaluation emphasises that many schools have integrated aspects of the Digital Learning Plans into their School Self Evaluation process enhancing their strategic importance.

Source: Leal Fonseca, Guarín Muñoz and Morales Velásquez (2022^[51]), *Digital education policies in Colombia: Emerging trends and future perspectives*, <https://unesdoc.unesco.org/ark:/48223/pf0000384129?posInSet=1&queryId=29d456ef-180a-4164-b8d6-dd83db7eba06>; Butler and Leahy (2021^[52]) *Baseline report: Towards a successor Digital Strategy for Schools to 2027*, <https://www.gov.ie/en/publication/69fb88-digital-strategy-for-schools/>.

- 3. Introducing tools to support implementation planning.** To effectively steer these processes without restricting the capacity of subnational and institutional actors to respond to local realities, the federal government can provide a range of tools to support implementation planning. These tools could be tested during a pilot phase and developed and adapted through collaboration with participating actors. Possible tools could include a well-defined theory of change, a planning template with requirements for budgeting, monitoring and evaluation, good practice guidelines and quality frameworks for implementation at school or administration level. Carefully designed monitoring mechanisms can also serve as an implementation tool (see below).

Foster learning networks with clear purpose and resources

Professional learning and support networks have emerged as a powerful tool in building capacity across actors with similar professional roles or priorities. In education, they provide teachers and other actors with enhanced opportunities for exchanging experiences and resources, and for collaborative learning. But learning networks are not only an important tool for capacity building, they also carry multiple co-benefits that can help address wider challenges in education. Professional collaboration among teachers has been shown to increase the use of impactful cognitive activation practices in class and daily collaborations between colleagues, as well as to improve job satisfaction and teacher self-efficacy (OECD, 2020_[53]).

Networks can be a valuable tool in promoting the adoption of digital technologies: teachers tend to engage in communities primarily for topics related to teaching with technology or other digital education issues. At the same time, digital technologies themselves can facilitate participation in networks through digital environments, such as wikis, networking sites, platforms, learning management systems and social media along with various digital tools, such as forums, instant messaging and podcasts (Minea-Pic, 2020_[11]).

However, participation among teachers in collaborative forms of professional development is lower than for more traditional forms: in TALIS 2018, only 44% of teachers reported participating in a network of teachers for professional development in the preceding 12 months, compared to 76% who reported attending courses or seminars. In Brazil, these shares were smaller with a wider gap between them at 26% and 65% respectively. (OECD, 2020_[53]).

Beyond teachers, networking can support efforts to strengthen capacity across all stakeholders thus playing a key role in building a policy ecosystem that puts empowered people at its centre. Networks should include teachers and other educators such as school leaders but also parents, local authorities, teacher trainers and regulators. These actors can be neglected in such efforts despite rarely being specialists in digital education and pedagogy.

There is considerable scope for Brazil to expand the role of professional networks in supporting capacity building for the implementation of digital technologies in education. Although a combined approach is likely to provide more comprehensive support, networks can be organised in various ways (Box 6). Options include:

- *By actor:* Brazil could ensure dedicated networks for school leaders, teachers, for those working in the EdTech sector, researchers, civil society actors, state administrators and municipal administrators. By addressing one specific group of people, the network may be able to better target specific needs and members may be better equipped to support each other.
- *By organisation:* Developing dedicated school networks, research institution networks, teacher training networks and/or municipal networks could enable Brazil to foster transformation at scale with more scope for inter-regional or national coverage. This could also be a way of pooling resources across organisations that share similar goals.
- *By topic:* To encourage interactions between people with different expertise, networks could be established to address specific topics, challenges or objectives within the wider policy area of digital education reform. For example, school leaders, state and municipal authorities and EdTech actors could network on matters related to mobilising digital technologies to enhance educational management. Alternatively, schools, civil society actors and researchers could network for capacity building related to enhancing foundational literacy through digital technologies. In this way, actors pool expertise and resources to address mutual goals.

Box 6. Mobilising networks to build schools' and teachers' digital capacity in Ireland and Korea

Encouraging schools to collaborate on digital innovation in Ireland

Ireland's *School Excellence Fund* encourages schools to collaborate in common strategic priority areas through local clusters across education levels. These clusters submit innovative proposals for new projects or initiatives and can receive funding of up to EUR 20 000 or EUR 55 000 for clusters serving students from disadvantaged communities. By 2021, the *School Excellence Fund – Digital and Science, Technology, Engineering and Mathematics* (2018) had provided over EUR 1 million to 42 clusters of 200 schools to support creative and innovative ways of embedding digital technologies in learning, teaching and assessment. Clusters received professional support from the Professional Development Service for Teachers, which included fostering networking and sharing good practice between clusters. The initiative ended in 2022 and an evaluation is informing new approaches to promoting school-level innovation as part of the Digital Strategy for Schools to 2027. Findings from broader evaluations indicate appreciation for the inter-school collaboration and a desire for this to be further developed.

Empowering teachers to support each other's professional learning in Korea

To support teachers during the COVID-19 pandemic, Korea established an online *community of 10 000 representative teachers* (2020), one from almost every school across the country, to promote the exchange of good practice in online education and to give advice to help address any issues colleagues encounter. The community provided a real-time, interactive communications channel among 17 Provincial Offices of Education, the 10 000 representative teachers and other relevant institutions, including the Ministry of Education. Alongside this, Korea launched the *Knowledge Spring* platform (2021) through which teachers can flexibly organise professional learning tailored to their needs. The platform also allows for interactive online knowledge sharing between teachers, with a central cohort of teacher-volunteers who act as consultants for their colleagues (OECD, 2021^[25]; 2020^[14]).

Source: Butler and Leahy (2021^[52]) *Baseline report: Towards a successor Digital Strategy for Schools to 2027*, <https://www.gov.ie/en/publication/69fb88-digital-strategy-for-schools/>; OECD (2020^[54]), "Education Policy Outlook in Ireland", *OECD Education Policy Perspectives*, No. 18, <https://doi.org/10.1787/978e377b-en>; OECD (2020^[14]), OECD (2020), *Lessons for Education from COVID-19: A Policy Maker's Handbook for More Resilient Systems*, <https://doi.org/10.1787/0a530888-en>; OECD (2021), *Education Policy Outlook 2021: Shaping Responsive and Resilient Education in a Changing World*, <https://doi.org/10.1787/75e40a16-en>.

Policy pointers: Initiating networks through a top-down approach risks inhibiting their capacity for innovation. Nevertheless, there are steps that federal or subnational authorities could take to encourage networking:

1. It will be important to **understand the extent to which relevant networks are already in operation in Brazil** to identify gaps in provision by actor, organisation or topic as well as geographical area. Brazil could also investigate the impact of these existing networks with a view to understanding how they could be strengthened and expanded.
2. Brazil can **seek out ways of establishing a more conducive policy environment to stimulate high-quality and sustainable networking**. In 2018, the OECD undertook analysis of the features of a large set of networks working on innovative pedagogies and in 2020 reviewed the impact of online networks. These two pieces of work identified facilitating and hindering factors for educational networks that could support Brazil to identify practical ways forward. These can be organised into internal characteristics of the network itself and external characteristics of the

context in which the networks operate (Table 4). Critical elements for the federal government include financially supporting network development and establishing incentives for participation.

Table 4. Factors that can facilitate or hinder networks for educational innovation

	Facilitating factors	Hindering factors
Internal characteristics	Organisational effectiveness (i.e. a well-organised structure, appropriate for the context and circumstances)	Insufficient time to engage in the work of the network
	Effective external communication (i.e. to raise visibility and disseminate findings)	Lack of dynamism or buy-in from the network members
	A well-defined value proposition that meets a pressing need	Lack of openness among members to transforming traditional practices
	Effective leadership	
	Quality of network infrastructure (i.e. ICT infrastructure including collaborative tools, and user friendly platform; opportunities for in-person interactions)	Conflicting time or work schedules among members which impede synchronous interactions
	Skilled and resourced moderators who encourage participation without dominating	
External characteristics	A policy environment that stimulates network development	Financial barriers (i.e. insufficient funds or unstable funding streams)
	Supportive authorities that commit to helping sustain the network's existence	Insufficient incentives, such as recognition of professional learning through badges or certification, to encourage actors to engage time and effort in the work of the network

Notes: Compilation of findings based on a survey of school networks and a literature review.

Source: Paniagua, A. and D. Istace (2018^[55]), *Teachers as Designers of Learning Environments: The Importance of Innovative Pedagogies, Educational Research and Innovation*, OECD Publishing, Paris, <https://doi.org/10.1787/9789264085374-en>; Minea-Pic, A. (2020^[11]), "Innovating teachers' professional learning through digital technologies", OECD Education Working Papers, No. 237, OECD Publishing, Paris, <https://doi.org/10.1787/3329fae9-en>.

How can Brazil know if digital reform processes are having their desired impact and should be scaled up?

Policy evaluation efforts must be at the core of digital education reform processes in Brazil. Evaluating digital education reforms has several advantages for the system: 1) it helps to align reform actions and resources with stated purposes, requirements and regulations; 2) it facilitates learning about the ways in which reforms are implemented at different levels of the system and the extent to which they have impact on outcomes for different groups of students; 3) it offers insight into how resources could be used more efficiently and effectively (Golden, 2020^[27]). To nurture an evaluative culture in digital education reform processes, Brazil should consider developing a dedicated digital education evaluation and assessment framework and fostering knowledge brokerage.

Develop a dedicated monitoring and evaluation framework for digital education

The knowledge produced from policy evaluation and monitoring mechanisms can inform decision making, improve dialogue between actors, support accountability and contribute to transparency (Viennet and Pont, 2017^[43]). A comprehensive monitoring and evaluation framework aligned to a country's strategic vision for digitalisation is therefore key to supporting implementation and policy development, assessing progress towards policy objectives, identifying potential implementation challenges and providing evidence for policy continuation, adaptation or expansion (OECD, 2023^[26]).

Many education systems, including Brazil, collect different monitoring and evaluation information relevant to digital education policies. This can include, for example, Internet connectivity across the school network, the availability, adequacy and quality of digital technologies and equipment in schools, the implementation of cyber security, as well as implementation measures and teacher or school capacity to implement digital

pedagogies. However, beyond ad hoc or time-limited measures, few systems have developed a dedicated monitoring and evaluation framework for digital education that supports a more coordinated and holistic approach. In Brazil, such a framework could be particularly valuable, not just because alignment has been a challenge in previous digital education reforms, but also because Brazil's existing wider evaluation and assessment architecture represents a strength of the education system which can be adapted and built upon (OECD, 2021^[56]). Box 7 provides illustrations of how related efforts are implemented in other education systems.

Policy pointers: The first step for Brazil will be to establish a policy monitoring and evaluation model that collects sufficient information to determine whether policy implementation is delivering on the shared vision. This should be driven by the question, “what *should* we measure?” not “what *can* we measure?”. Following the development of a standardised model, Brazil should follow three lines of action:

- 1. Brazil can map existing data collection efforts** related to digital education to identify coverage and gaps. This includes, for example, participation in international assessments and surveys that cover aspects of digital education, the regular surveys on ICT in Education run by the Regional Center for Studies on the Development of the Information Society and monitoring efforts for the implementation of existing reforms such as computational thinking curricula through the BNCC reform or the inclusion of digital competencies in initial teacher training as set out in the Common National Base for Initial Teacher Education.
- 2. Brazil can consider ways to mobilise or repurpose existing components of the wider evaluation and assessment system.** For example, Brazil's *National Education Quality Index* (IDEB) provides performance scores at school, municipal, state or national level from primary to upper secondary education. Currently based on results from standardised assessments and indicators related to student transitions, Brazil could explore ways to integrate aspects of digital education into the IDEB. Furthermore, there may be scope for the *National System for Evaluation of Elementary Education*, Brazil's biannual national standardised assessments for students to integrate aspects related to digital skills, particularly as Brazil adapts the assessments to align with the introduction of the BNCC. Brazil has also developed its own self-assessment tools for digital competence through a collaborative effort between the Innovation Centre for Brazilian Education, a non-profit association, and government bodies (OECD, 2023^[34]). Expanding the implementation of these tools could provide valuable monitoring information at scale.
- 3. Brazil will need to consider where best to introduce new monitoring and evaluation components to cover gaps.** These should include qualitative and quantitative approaches and be spread across actors to ensure comprehensiveness while avoiding administrative burden. The OECD recently reported that as of 2023, Brazil did not have a longitudinal information system or student register (OECD, 2023^[34]): this is a clear gap to be filled. In addition, policy evaluation components will need strengthening as fewer relevant mechanisms already exist in Brazil. Brazil can also explore how digital technologies themselves can support the development of new sources of monitoring information, for instance, by facilitating the administration of data collection instruments and accelerating the speed of processing and analysing data.

Box 7. Monitoring and evaluation frameworks for digital education in Colombia and Ireland

Building a monitoring and evaluation framework for educational innovation in Colombia

As part of the *Technologies for Learning: National policy to promote innovation in education through digital technologies* (2020), Colombia has committed to developing a systematic process for monitoring and evaluating the use, access and impact of digital technologies in education. This will include establishing a standardised monitoring and evaluation model adopted by Secretariats of Education across the country and with unified instruments for collecting and analysing data on both digital infrastructure and digital education practices in schools. The Ministry of National Education will design an Information Management System to compile the data. An Educational Innovation Index will help assess the level of integration of digital technologies within schools and local administrations and a Digital Evolution Index will help assess the adequacy of digital infrastructure across the school network. Finally, the Ministry is also working with the Colombian Institution for Educational Evaluation to explore the development of an assessment of students' digital competence.

Benefitting from a comprehensive and ongoing monitoring and evaluation framework in Ireland

In Ireland, comprehensive, ongoing monitoring and evaluation of the *Digital Strategy for Schools (2015-2020)* helped the Department of Education to enhance the implementation of the Strategy in real time and has been critical in informing the development of the *Digital Strategy for Schools to 2027*. Components include:

- Ongoing Digital Strategy Actions Plans (2017-2020), accompanying annual progress reports and interim review.
- Intermittent and targeted evaluation reports including those on specific actions within the Strategy (e.g. the Digital Learning Framework, the School Excellence Fund) and an Inspectorate report evaluating digital learning in schools.
- At the end of the Strategy's implementation period, an in-depth review which synthesised findings from the above components, as well as an extensive and multi-faceted consultation process with teachers, school leaders, parents, learners, professional development providers, school boards and policy makers.
- Evaluative information and data on digital learning in schools collected through wider mechanisms, including School Self Evaluation reports and school inspection reports.

These monitoring and evaluation actions are carried out by both internal actors, such as people within the Department for Education or associated bodies, and external actors, such as academic researchers or research organisations.

Source: National Planning Department Colombia (2020^[57]), *Technologies for learning: National policy to promote innovation in education through digital technologies*, https://siteal.iiep.unesco.org/sites/default/files/sit_accion_files/tecnologias_para_aprender.pdf; Butler and Leahy (2021^[52]) *Baseline report: Towards a successor Digital Strategy for Schools to 2027*, <https://www.gov.ie/en/publication/69fb88-digital-strategy-for-schools/>.

Facilitate the dissemination and use of evaluative findings to help scale up good practice

A dedicated monitoring and evaluation framework for digital education will help enhance the collection of relevant information and the identification of related insights for policy and practice. However, effectively disseminating these insights between key education actors is also a crucial precursor to putting it to good use. A system that lacks the capacity for communication and dissemination of key messages to wide audiences will struggle to use the evidence it collects and generates effectively (Golden, 2020^[27]).

Dissemination is also a critical tool for scaling up innovative practices and strengthening trust between different actors and levels of the system. As such, identifying and streamlining best practices through quality dissemination empowers institutions and educators to exercise a bottom-up influence and contribute to improvement cycles (OECD, 2021^[25]).

Education systems need to consider the extent to which policy makers, practitioners and other stakeholders have access to evidence in a form that is useable and understandable, so they can effectively apply it to improve policy and practice (OECD, 2022^[28]). This entails finding ways to effectively curate information for the needs of different education actors, finding the right balance between over-simplification and excessive technical detail. At the same time, dissemination should be used as an instrument to signal priorities and scale up-innovative, cost-effective and impactful local initiatives. In that sense, disseminating information is not simply a top-down process, but also bottom-up and lateral. It can also be worthwhile to disseminate evidence that shares both strengths and areas for improvement as well as clarifying where the evidence is strong or only emerging in order to strengthen public trust (OECD, 2021^[25]).

Policy pointers: Facilitating access to and use of evidence can be achieved through both informal and formal channels.

1. **Brazil could encourage the development of informal dissemination through networks.** There is growing recognition that linear dissemination approaches are not sufficient; relationship building is also essential (OECD, 2022^[28]). Either dedicated research networks or wider networks that actively disseminate and discuss evaluative information can therefore help strengthen evidence-engagement across members. Such information exchange is generally member-generated and is therefore more difficult for policy makers to influence beyond wider efforts to facilitate networking. However, Chile has recently launched a related initiative of interest (Box 8).

Box 8. A national campaign to identify and promote educational innovation in Chile

In Chile, the *Innovation Network for Educational Transformation* (2022) was established to strengthen professional collaboration and learning among educators and schools and help scale-up good practice in digital and pedagogical innovation. The Network was established as part of the *Education Recovery Plan* (2022) following the COVID-19 pandemic and is an initiative of the Center for Innovation. In 2022, the Network ran a national campaign to highlight and learn from innovative approaches developed during the period of the pandemic and post-pandemic recovery. The Network organised in-person and online workshops at both regional and national level through which education actors were invited to share and explore examples of innovation. On an ongoing basis, educators can also submit innovations to the Network which then organises and reports them via the website of the Center for Innovation.

Source: Ministry of Education Chile (2022^[58]), “Innovation Network for Educational Transformation” [“Red de Innovación para la transformación educativa”], <https://www.innovacion.mineduc.cl/iniciativas/innovaci%C3%B3n-educativa/red-de-innovaci%C3%B3n-para-la-transformaci%C3%B3n-educativa>.

2. **Brazil should consider ways to coordinate, centralise and better mobilise the knowledge already being produced by representatives from civil society, academia and EdTech.** This could take the form of a user-generated knowledge platform that centralises evidence regarding the use of digital technologies in education. In this case, Brazil would also need to consider how to ensure that the information shared upholds high-quality standards. Alternatively, the federal

Ministry or another appointed actor could take on responsibility for the curation of content. In both cases, efforts to promote the reach of the evidence and its practical application will be important.

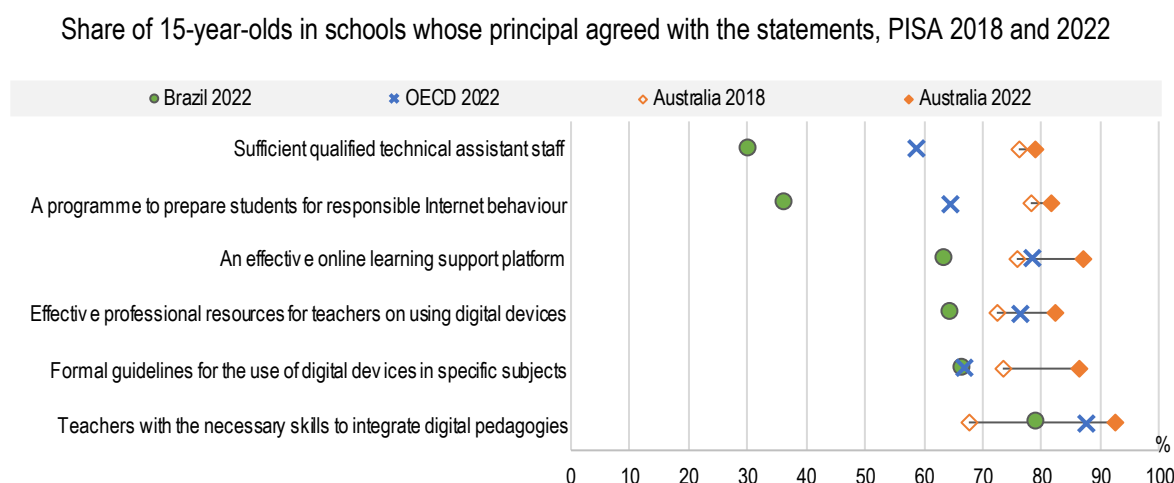
- 3. Brazil could explore the development of more formal dissemination channels through establishing a knowledge brokerage agency.** This is an emerging mechanism across OECD education systems that supports information sharing and quality assurance (OECD, 2022^[28]). Such agencies generally seek to collaborate with as wide a community of researchers, practitioners and policy makers as possible to broaden the relevance of their work and findings. Some agencies or programmes are principally funded by the education ministry; in these cases they can be housed within the Ministry itself or maintain their independence. Others are formally and financially independent receiving funding from multiple channels which may include public funds but also private or non-governmental investment (OECD, 2022^[28]). Another option could be to seek cross-sectoral funding, establishing a knowledge brokerage for digital policy in general.

Annex 1: Digital education in New South Wales (Australia)

Key indicators of educational performance, equity and digital preparedness in Australia

In PISA 2022, students in Australia² performed above the OECD average in reading and science and around average in mathematics. However, there are long-term negative trends in all three. Socio-economic status explained 14.6% of the variance in mathematics, similar to the OECD average. School-leader reports indicated that, compared to other OECD education systems, schools in Australia are well-prepared for the digital transition (Figure 6). At state level, New South Wales is a high-performing education system with high outcomes in national standardised assessments across disciplines (ACARA, 2022^[59]).

Figure 6. School digital preparedness in Australia



Note: For PISA 2022, caution is required when interpreting estimates for Australia because one or more PISA sampling standards were not met. See source material for more information.

Source: OECD (2019^[21]), PISA Database 2018, <https://www.oecd.org/pisa/data/2018database/>; OECD (2023^[8]), PISA Database 2022, <https://www.oecd.org/pisa/data/2022database/>.

Digital education policy reforms in New South Wales (Australia)

The *Schools Digital Strategy* (2019) in New South Wales provides a seven-year roadmap to enable learners to develop and thrive through digital education. The Strategy is the result of a highly collaborative process which extensively engaged school-level stakeholders to understand their needs and perspectives. Key goals include empowering schools to shape their own digital journey (i.e. to self-assess their digital maturity, plan improvements and measure impact), enhancing digital equity and capability across schools and providing digital support to schools (NSW Department of Education, 2019^[45]).

Implementation is envisaged across four phases. During setup (6 months), the Department established small pilot initiatives and conducted cost-benefit analysis of different actions. In the next phase (2 years), New South Wales scaled up the pilots and established a monitoring and evaluation framework. Phase 3 (2 years), aims to spread innovation across the school network, increasing schools' digital capability. The final phase (3 years), foresees digital delivery as fully integrated in schooling. The Strategy has been highlighted in international analysis as having a well-defined, well-resourced vision and implementation plan, and well-defined actions for tackling digital equity (OECD, 2023^[26]; Marrone et al., 2021^[46]). When surveyed in 2022 and 2023, 80% of school staff reported that the initiatives made their daily tasks easier and 70% felt their digital skills had improved (NSW Department of Education, 2023^[39]).

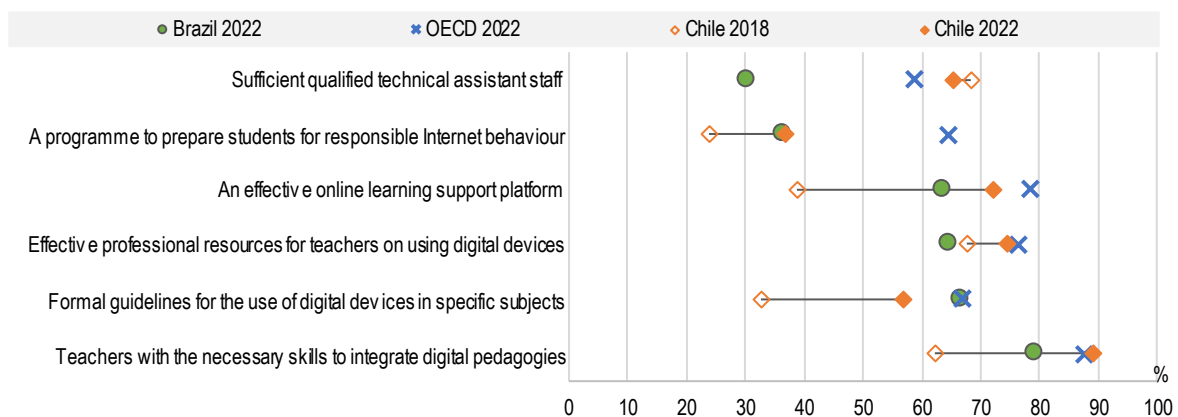
Annex 2: Digital education in Chile

Key indicators of educational performance, equity and digital preparedness in Chile

In PISA 2022, students in Chile performed below the OECD average in reading, mathematics and science. Reading performance has improved over the long-term, but mathematics and science have remained stable. Socio-economic status explained 12.5% of the variance in mathematics scores, below the OECD average of 15.5% (OECD, 2023^[4]). School leaders' reports revealed that relative to other OECD education systems, indicators of digital readiness in schools in Chile are generally positive, however, more could be done with regards to supporting students to behave responsibly online and tailoring guidance to the needs of different subject teachers (Figure 7).

Figure 7. School digital preparedness in Chile

Share of 15-year-olds in schools whose principal agreed with the statements, PISA 2018 and 2022



Source: OECD (2019^[21]), PISA Database 2018, <https://www.oecd.org/pisa/data/2018database/>; OECD (2023^[8]), PISA Database 2022, <https://www.oecd.org/pisa/data/2022database/>.

Digital education policy reforms in Chile

In 2018, Chile established the *Centre for Innovation* within the Ministry of Education to oversee the development and implementation of digital education policy that supports innovative pedagogies. Policies related to the development of learners' skills are under the Curriculum and Evaluation Unit. The Centre aims to strengthen the innovation capacity of the education system through digital technologies. It has three strands of work: pedagogical innovation, digital innovation and digital education infrastructure. Although there were some challenges during the COVID-19 pandemic when clear institutional leadership was necessary (Claro et al., 2022^[36]), these organisational reforms appear to have helped establish a clearer innovation-focused vision for digital education in Chile, with the aim that this is shared across the administration.

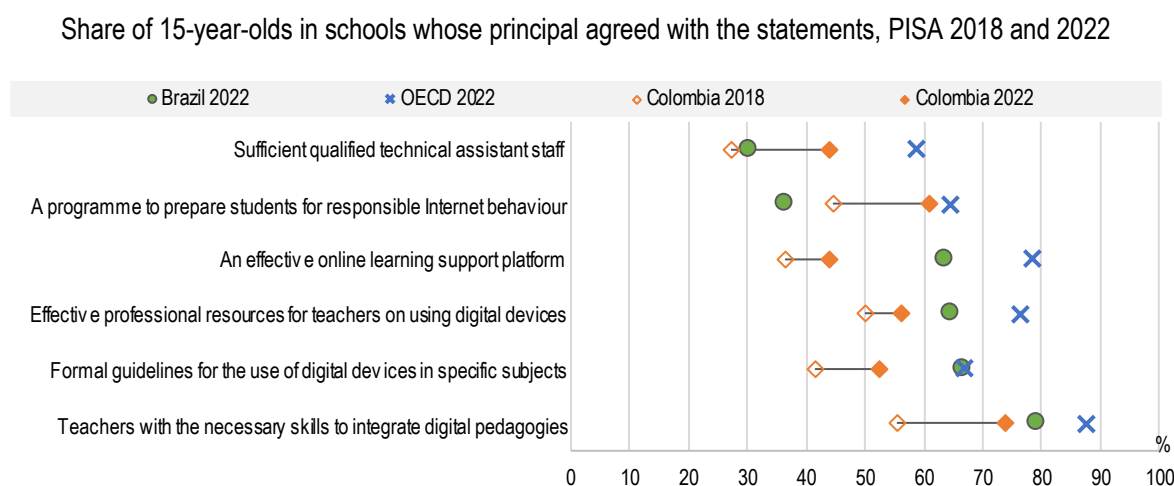
Key initiatives of the Centre for Innovation include the *Innovation Network for Educational Transformation* (2022) which aims to stimulate professional learning and collaboration between educational communities around promising examples of pedagogical and digital innovation at local level. In addition, the Centre supports schools and teachers to adopt the *Digital Classbook* (a learning management information system) offers professional learning programmes for educators and ICT coordinators and runs several key digital infrastructure initiatives aiming to address digital divides particularly in rural areas (Claro et al., 2022^[36]).

Annex 3: Digital education in Colombia

Key indicators of educational performance, equity and digital preparedness in Colombia

In PISA 2022, students in Colombia performed below the OECD average in reading, mathematics and science, however, performance has been improving in reading and science. Socio-economic status explained 16.2% of the variance in mathematics scores, above the OECD average (OECD, 2023^[41]). School leaders' reports reveal improvements in schools' digital preparedness across various indicators, however results for Colombia remain consistently below respective OECD averages (Figure 8).

Figure 8. School digital preparedness in Colombia



Source: OECD (2019^[21]), PISA Database 2018, <https://www.oecd.org/pisa/data/2018database/>; OECD (2023^[8]), PISA Database 2022, <https://www.oecd.org/pisa/data/2022database/>.

Digital education policy reforms in Colombia

In 2019, Colombia began developing the *Technologies for learning: National policy to promote innovation in education through digital technologies* (2020). The policy covers four areas of action: 1) increase access to digital technologies in education institutions including innovative learning spaces; 2) improve Internet connectivity in education institutions; 3) promote the integration of digital technologies into innovative teaching and learning practices; and, 4) strengthen monitoring and evaluation to measure the use, access and impact of digital technologies in teaching and learning (Leal Fonseca, Guarín Muñoz and Morales Velásquez, 2022^[51]). The Ministry of Information and Communications Technologies, the Ministry of National Education and the National Learning Service collaborate to lead the implementation of the policy.

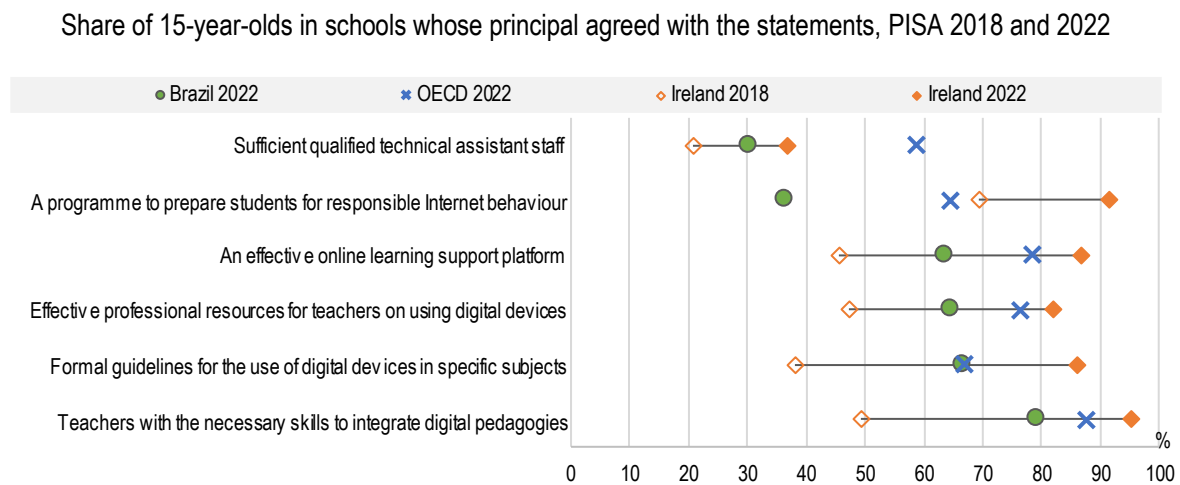
The policy is informed by a review which found that previous digital education reforms have helped to increase access to ICT and the Internet in educational institutions and provide teacher professional development. However, the review also found ongoing challenges related to the sustainability of action over time, coverage and scale, and coordination and alignment between actions and actors across the country. As such, key initiatives of *Technologies for Learning* include designing and implementing a *Monitoring and Evaluation System for Educational Innovation* that compiles information on the use of ICT, access to digital infrastructure, teacher training and students' digital skills, as well as evaluating the policy itself. In addition, the policy envisages developing a model for targeting and prioritising schools that need better digital infrastructure so as to reduce regional gaps, and a strategy to enhance the development of an ecosystem of educational innovation (National Planning Department Colombia, 2020^[57]).

Annex 4: Digital education in Ireland

Key indicators of educational performance, equity and digital preparedness in Ireland

In PISA 2022, students in Ireland³ performed well above average in reading, mathematics and science. Performance has remained stable over the long term with a more recent decline in mathematics performance. Socio-economic status explained 13.0% of the variance in mathematics scores, below the OECD average of 15.5% (OECD, 2023^[4]). School leaders' reports indicate that Ireland made considerable progress in enhancing school digital preparedness between 2018 and 2022 (Figure 9).

Figure 9. School digital preparedness in Ireland



Note: For PISA 2022, caution is required when interpreting estimates for Ireland because one or more PISA sampling standards were not met. See source material for more information.

Source: OECD (2019^[21]), PISA Database 2018, <https://www.oecd.org/pisa/data/2018database/>; OECD (2023^[8]), PISA Database 2022, <https://www.oecd.org/pisa/data/2022database/>.

Digital education policy reforms in Ireland

Ireland's *Digital Strategy for Schools to 2027* (2022) is built around three pillars: 1) embedding digital technologies in teaching, learning and assessment; 2) digital technology infrastructure; and 3) policy, research and digital leadership (Department of Education Ireland, 2022^[32]). Ireland developed a detailed *Implementation Plan (2023-24)* to accompany the first phase of the Strategy. Following this, Ireland will conduct a progress review to inform the preparation of a second implementation period (OECD, 2023^[26]).

The Strategy's predecessor, the *Digital Strategy for Schools 2015-20* included the development of a *Digital Learning Framework* (2017) for schools - a roadmap to support planning, implementation and evaluation. The Framework was trialled in some schools in 2017/18 with positive feedback and evidence of better ICT use in teaching, learning and assessment. Suggested improvements fed into a revised Framework implemented nationally from 2018/19 alongside an extensive professional development programme. Since 2018, as part of the *School Excellence Fund*, Ireland has also provided funding to schools to collaborate in local, cross-sectoral clusters on innovative digital projects (OECD, 2020^[54]). Extensive monitoring and evaluation of the 2015 Strategy informed the development of the current one, including recommendations for a well-funded, coherent, flexible and sustainable model of professional learning and annual, targeted funding addressing differences in broadband access between education levels (Butler and Leahy, 2021^[52]).

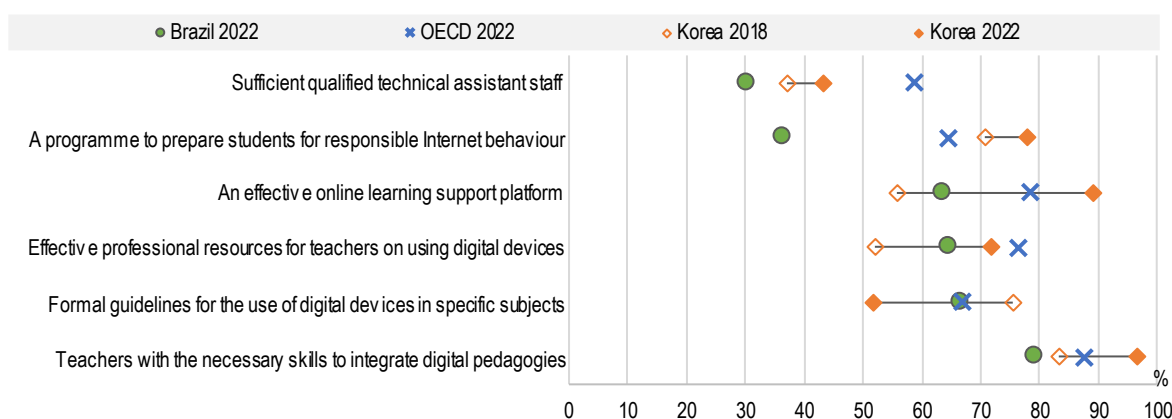
Annex 5: Digital education in Korea

Key indicators of educational performance, equity and digital preparedness in Korea

In PISA 2022, students in Korea performed well above the OECD average in reading, mathematics and science although mean performance has been steadily declining in reading over the long term. Socio-economic status explained only 12.6% of the variance in mathematics scores, below the OECD average of 15.5% (OECD, 2023^[4]). School leaders' reports reveal that relative to other OECD education systems, indicators of digital preparedness in schools in Korea are consistently positive and continue improving (Figure 10)

Figure 10. School digital preparedness in Korea

Share of 15-year-olds in schools whose principal agreed with the statements, PISA 2018 and 2022



Source: OECD (2019^[21]), PISA Database 2018, <https://www.oecd.org/pisa/data/2018database/>; OECD (2023^[8]), PISA Database 2022, <https://www.oecd.org/pisa/data/2022database/>.

Digital education policy reforms in Korea

Korea has launched six consecutive five-year *Master Plans on ICT in Education* since 1994. The current plan (2019-2023) identifies activities organised by four domains: 1) smart learning environments; 2) innovation for sustainable ICT in education; 3) personalised educational delivery via ICT; and 4) digital infrastructure for sharing educational information. Key actions for transforming schools have included policy efforts to upgrade the digital infrastructure, remodel outdated digital learning environments and widen access to digital resources, including through the piloting of digital textbooks in 1 200 schools. Alongside the Master Plans, the Ministry of Education's *SMART education initiative* (2011) has worked to transform the content, method, evaluation and environment of teaching and learning in schools (OECD, 2021^[60]).

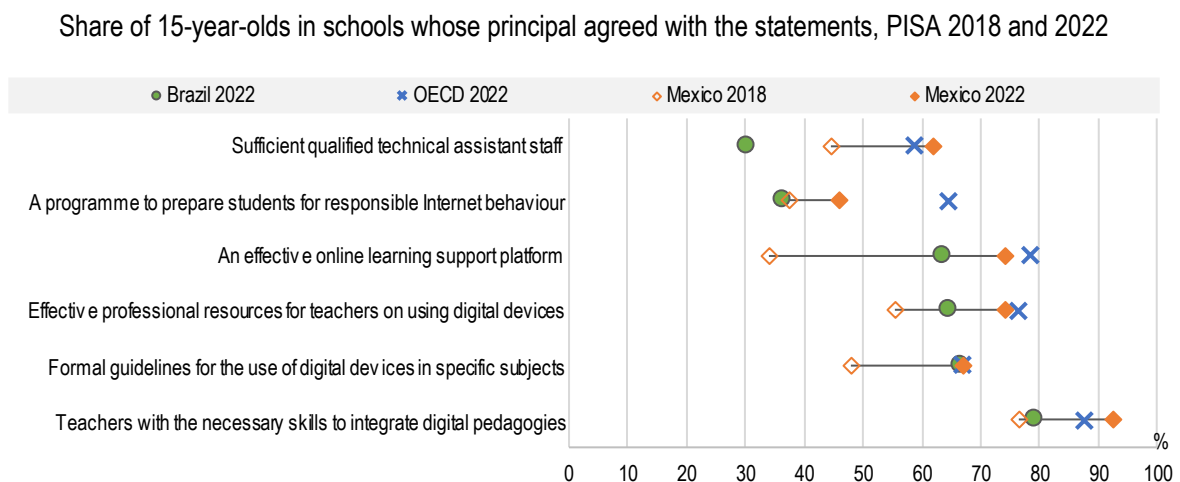
These long-term digital education policy efforts meant Korea was relatively well-placed to navigate the school closures of the COVID-19 pandemic (OECD, 2021^[60]). Nevertheless, Korea undertook many actions during COVID-19 to enhance support for educators and schools. In particular, this included establishing nationwide professional networks for teachers through the *10 000 teacher community* and the *Knowledge Spring* platform (OECD, 2021^[25]). Post-COVID, the Ministry of Education has been working to further promote innovation in digital education practices by exploring ways for teachers and schools to adopt emerging technologies with a particular focus on strengthening personalised and blended learning opportunities for students.

Annex 6: Digital education in Mexico

Key indicators of educational performance, equity and digital preparedness in Mexico

In PISA 2022, students in Mexico performed below the OECD average in reading, mathematics and science. Performance has remained steady in all three disciplines over the long term. Socio-economic status explained 10.4% of the variance in mathematics scores, below the OECD average of 15.5% (OECD, 2023^[41]). Despite considerable improvements, particularly with regards to providing access to online learning support platforms, school leaders in Mexico continue to feel that their schools are less prepared for the digital transition than on average across OECD education systems (Figure 11).

Figure 11. School digital preparedness in Mexico



Source: OECD (2019^[21]), PISA Database 2018, <https://www.oecd.org/pisa/data/2018database/>; OECD (2023^[8]), PISA Database 2022, <https://www.oecd.org/pisa/data/2022database/>.

Digital education policy reforms in Mexico

Mexico’s *Digital Education Agenda (2020)* is a policy framework bringing together short, medium and long-term digital education reforms. It is based on five axes: 1) providing teacher training and certification of digital skills; 2) establishing a digital culture within Mexican education; 3) providing quality digital education resources; 4) strengthening and expanding digital education infrastructure; and 5) promoting research and development. To support and oversee implementation, the Ministry of Public Education established a Project Committee with representatives from the different secretariats within the Ministry and other relevant agencies (Ministry of Public Education Mexico, 2020^[61]).

The Digital Education Agenda aims to achieve greater alignment and complementarity between key ongoing reforms. This includes *@prende 2.0 (2017)*, which began as a pilot project and was the first federal policy to adopt a more holistic approach to digital education reform, incorporating capacity building efforts alongside infrastructure expansion. As part of the policy, day-to-day implementation of digital education initiatives at federal level was positioned under the Directorate-General @prende.mx. While historically the focus of federal efforts in digital education reform in Mexico were on infrastructure and connectivity, @prende 2.0 established teacher professional learning as a focus and, more recently, the COVID-19 pandemic has seen another shift in activities to the curation of digital resource banks and online learning (Díaz Barriga Arceo et al., 2023^[62]).

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Notes

¹ Supporting the implementation of the BNCC, Brazil introduced a Common National Base for Initial Teacher Education (2019) and a Common National Base for Continuous Professional Development (2020), plus accompanying National Curriculum Guidelines.

² For PISA 2022, caution is required when interpreting estimates for Australia because one or more PISA sampling standards were not met. See Annex A in OECD (2023^[4]).

³ See Note 2. The same applies for Ireland.

This Education Policy Perspective has been authorised by Andreas Schleicher, Director of the Directorate for Education and Skills, OECD.

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