2 Digitalisation and early childhood education and care: Trends and challenges

This chapter provides an overview of digitalisation trends with implications for young children and early childhood education and care (ECEC). It reviews economic and social changes shaping the skills bundle for the digital age, as well as trends in young children's engagement with digital technologies and associated risks and opportunities. The chapter describes policy challenges for supporting young children and ECEC systems through the digital transformation as identified by the countries and jurisdictions participating in the OECD project ECEC in a Digital World.

Key findings

Digitalisation brings forth deep and accelerated transformations to the economy, civic life and the world of education. Among their implications for young children, these changes broaden the bundle of skills needed to thrive in a technology-rich world. Strong cognitive and socio-emotional skills, as well as strong digital literacy, are key components of this bundle. High-level thinking and interpersonal skills complement the enhanced capabilities of new technologies.

In home environments, young children (aged 0-6) are interacting with digital technologies at increasingly younger ages, for a wide range of activities, and often with or under the supervision of their parents. The evidence base on the effects of digital technologies on children's early development and well-being is inconclusive, but research suggests that it is the quality of digital experiences rather than the amount of time they spend using digital tools that has the strongest influence on children's outcomes. Research also points to the importance of adapting digital media exposure and activities to young children's developmental stages, as the balance of risks and opportunities varies with age.

Early childhood can be a window of opportunity for introducing children and families to safe, creative and educational uses of digital technology, as it is a time when young children gradually gain autonomy in using digital tools but remain more accepting of adult guidance and supervision. ECEC settings can play an important role in supporting parents in their digital mediation practices and in levelling the playing field for developing early digital literacy for all children.

Responses to the *ECEC in a Digital World* policy survey (2022) suggest that risk-focused challenges dominate policy agendas for responding to the impact of digitalisation on young children. Protecting young children's privacy and preventing potential harms from the use of digital technologies are the challenges most commonly listed as being of major importance by countries and jurisdictions. However, many also attribute high relevance to seizing opportunities from digitalisation, including preparing young children for the future of education or promoting their agency and empowerment in digital environments. Concerns about digital divides are perceived as having a strong bearing on young children's opportunities to benefit from digitalisation.

ECEC continues to operate with large uncertainties about effective policies to respond to digitalisation, but increasing attention is being paid to the use of digital technologies in support of process quality. The limited available evidence suggests low preparedness for using digital technologies with children among ECEC teachers relative to a growing inclusion of digitalisation-related contents in training programmes for primary school teachers. However, the COVID-19 pandemic was a catalyst for rethinking policies regarding the use of digital technologies with children in ECEC.

When surveyed about responses to digitalisation in ECEC specifically, most countries and jurisdictions listed promoting safe and responsible uses of digital technologies by both ECEC staff and young children as the most important challenges, while preserving ECEC as a digital-free space was the lowest ranked priority. This suggests a commitment on the part of ECEC systems to help young children and ECEC staff to live with and manage the risks associated with digital technologies without foregoing their opportunities. Other policy challenges considered of major importance relate to the effective use of digital technologies in professional learning and collaboration, communication with families, or monitoring practices. Some countries and jurisdictions emphasise responses to digitalisation in work with children whereas others prioritise integrating digital technologies into processes that do not involve direct interactions with children.

Introduction

Digitalisation is a transformational force reshaping how people learn, work, communicate and participate in society, with the pace of these changes accelerating due to the development and combinatory enhancements of digital technologies (OECD, 2019[1]; 2019[2]; 2019[3]). Digitalisation affects young children in multiple ways, operating through a variety of channels and time frames. It has distal implications for today's children by shaping the society and the labour markets they will encounter in adulthood, and the school and higher education systems they will navigate in the coming years. Its impact is, however, more immediate and visible through the direct interactions that children have with digital tools, starting in their home environments. Supporting young children through the changes that digitalisation brings to the environments where they grow and learn involves a range of policy challenges as well as placing children, rather than technology, at the centre of the discussion.

This chapter provides an overview of some of the major transformations of the digital era, discussing their implications for young children. The first part of the chapter describes changes in the economy, society and education that are expected to modify the set of competences that will equip people to thrive in the future. It then reviews trends in young children's engagement with digital tools at home and the risks and opportunities associated with these experiences. The second part of the chapter describes challenges for the ECEC sector across multiple policy areas in adapting to the digital age. The chapter draws on responses to the *ECEC in a Digital World* policy survey (2022) to identify the priorities of participating countries and jurisdictions in making their ECEC systems responsive to digitalisation.

Digitalisation trends affecting young children

This section reviews global and long-term digitalisation trends affecting young children, drawing primarily on prior OECD work, including a selection of indicators from the *Going Digital Toolkit* (GDT) and work from the 21st Century Children project (Burns and Gottschalk, 2019[4]; 2020[5]). The second part of the chapter looks more specifically at digitalisation in ECEC.

Digital infrastructure

Infrastructure development underpins the use of digital technologies across sectors and contexts. Recent decades have witnessed a massive increase in the number of connected people and devices and in the volume of data flowing across online networks. In OECD countries, mobile broadband connectivity grew from 31 to 124 subscriptions per 100 inhabitants between 2009 and 2021 (GDT Indicator 11) (Figure 2.1). It is estimated that three Internet-connected devices were in service per person worldwide in 2022 (OECD, 2019[1]). Most of these connected devices are powered by fast processors and equipped with substantial storage capacity, technologies that have become more and more affordable over time. For instance, the cost of a megabyte of computer memory shrank from about USD 46 in 1990 to less than USD 0.01 in 2016 (Our World in Data, 2022[6]). The strong demand for connectivity has been met by a concurrent increase in network capacity, which nearly quadrupled between 2016 and 2021 across OECD countries, jumping from 2.4 GB to 8.4 GB of monthly data usage per mobile broadband subscription (GDT Indicator 15). These improvements in digital infrastructure enable individuals and organisations to engage with increasingly diverse online services and content. Further, and notwithstanding disparities in quality, the use of digital technologies is spreading across most segments of society. For instance, on average across European Union (EU) countries, 89% of adults living in households in the lowest income quartile were Internet users in 2021, so were 96% of adults in Korea and 84% of adults in the United States (GDT Indicator 51).

The economy in the digital age

Digitalisation is driving major changes in modern economies, spurring innovation and productivity gains but also bringing important disruptions to the world of work. Between 2001 and 2018, the contribution of digital-intensive sectors to economic growth averaged around 20% of the annual growth in real value added across OECD countries (GDT Indicator 8). And in most OECD countries, from 2005 to 2018, labour productivity was between 1.2 and 2.5 times higher in information industries than in non-agriculture business sector activities (GDT Indicator 1).

The digital transformation is visible in the labour market, where it creates new employment opportunities while shaking up many existing jobs. Between 2006 and 2016, highly digital-intensive sectors contributed significantly to job creation, accounting for 42% of newly created jobs, on average, across OECD countries. An analysis of job postings published online over the last decade in ten countries shows a strong increase in the demand for digital skills, with occupations such as software developers, programmers and engineers, and data scientists having experienced the highest rates of growth (OECD, 2022[7]). Digital skills are highly valued in this changing labour market and enjoy wage premia in many industries, particularly in growing occupations linked to new technologies, a pattern that holds for numeracy or management and communication skills, too (OECD, 2019[2]).

Figure 2.1. Uptake of broadband technology

Mobile broadband subscriptions per 100 inhabitants, 2009-21
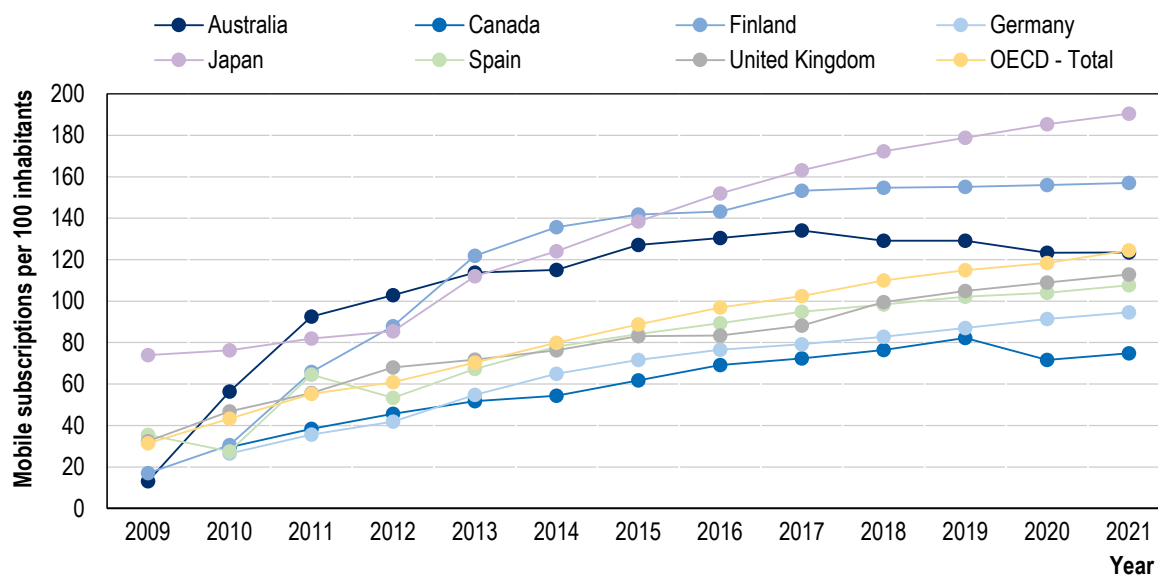
Source: OECD (n.d.), Going Digital Toolkit, http://goingdigital.oecd.org, (accessed on 10 December 2022).

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Meanwhile, much attention is being paid to the disruptions that advanced robotics and artificial intelligence technologies will bring to employment in the near future. On average across the countries that participated in the OECD Survey of Adult Skills, the percentage of jobs that face a high likelihood of automation over the next 10-20 years is estimated at 14%, with an additional 32% of jobs that could face significant changes due to the automation of a sub-set of the tasks required to carry them out (Nedelkoska and Quintini, 2018[8]). An expert assessment of computer capabilities suggests that current computers are already close

to reproducing the proficiency of the literacy skills that 62% of workers in OECD countries use on a daily basis (Elliott, 2017[9]). Overall, digital technologies may increasingly replace workers in easy-to-automate routine tasks while affording capabilities that complement rather than reproduce the creativity, problem solving and thinking skills that human workers exercise in more complex, non-routine tasks. Concerns over the extent of machine substitution for human labour may lead to overlooking the strong complementarities between technology and the skills in which humans maintain a comparative advantage, and which have the potential to increase productivity, earnings and the demand for labour (Autor, 2015[10]; Acemoglu and Restrepo, 2019[11]). In the digital age, employment opportunities tend to improve in occupations characterised by non-routine tasks and requiring high-level cognitive, interpersonal and digital skills (OECD, 2019[2]). Inversely, employment conditions tend to deteriorate in occupations that are intensive in low-skilled routine tasks.

Civic engagement and information flows in the digital age

Digitalisation is similarly reshaping many public services and conditions for civic participation, creating opportunities for citizens and governments to interact with greater ease, openness and transparency, but also introducing new tensions and dilemmas. Public administrations in many countries have digitised a large number of processes in public services, from tax collection to applications for public benefit programmes, and gradually shifted from simply facilitating e-government services to also trying to promote civic engagement. For instance, governments in most OECD countries conduct public consultations over the Internet, using digital channels to actively seek feedback from the general public and advisory groups (OECD, 2018[12]).

The uptake of digital government services indicates an increasing reliance on digital tools from the side of citizens as well. For instance, between 2010 and 2020, the share of individuals using the Internet to interact with public authorities increased from 40% to 57% on average in the EU, whereas it grew from 55% to 79% in Canada, and from 1% to 28% in Mexico (GDT Indicator 23). Citizens are also gradually embracing other digitally mediated forms of civic and political engagement. In 2017, 11% of adults across EU countries posted opinions on civic or political issues online, a share that grew to 16% among 16-24 year-olds. In countries like Iceland or Switzerland, close to one in four adults shared civic or political views online (OECD, 2019[3]).

In other spheres of social life, an increasing number of activities are also taking place online, as digital tools are revolutionising how society generates and consumes information. For instance, on average across OECD countries, the share of Internet users going online to obtain information about goods and services jumped from 40% in 2005 to 75% in 2020 (OECD, 2022[13]), and 57% of women and 47% of men reported having used the Internet to access health information in 2018 (OECD, 2019[3]). Unprecedented levels of digital connectivity are redefining the channels through which knowledge is produced and disseminated. Whereas traditional sources like encyclopaedias or the mass media of the 20th century were controlled by an elite few, the content of today's social media and online sites like Wikipedia is largely generated by networked interactions of millions of people across the world. Wikis, for which the number of pages grew from about 10 000 to over 250 million in just 20 years, are one example of the resources on which people increasingly rely to take decisions in the digital age (OECD, 2022[13]).

While digital tools can enable greater efficiencies in public services and more decentralised flows of information, these developments are not without risks. As digital content gets reproduced and amplified at an unprecedented speed, online mis/disinformation has emerged as a major challenge for modern democracies in the Internet age (Humprecht, Esser and Van Aelst, 2020[14]). Against this backdrop, media literacy education can play a key role in empowering children to discern false and misleading content and identify genuine and useful information (Hill, 2022[15]).

Education systems in the digital age

Digitalisation is also one of the major forces behind ongoing transformations in the world of education. On the one hand, education systems are redesigning their curriculum frameworks to respond to the challenges of a digitalised and globalised world. On the other hand, digital technologies are gradually permeating teaching and learning processes. These changes can shape the experiences of today's young children as they advance in their schooling, including their time in ECEC.

In recent years, countries across the world have been making a significant shift towards a 21st century curriculum, aiming to prepare learners not only for changing labour market needs but, more generally, to navigate complexity and uncertainty and be able to shape their own perspectives, ensure their individual well-being, and contribute to collective prosperity and sustainability. This is reflected in an increasing emphasis on cross-curricular content, competency-based curricula, personalised and flexible curricula, and digital curricula. As put forward by the OECD Learning Compass 2030, what is commonly articulated across these types of curricula are future visions of learner profiles that emphasise both cognitive (e.g. critical thinking, creativity) and socio-emotional skills (e.g. self-awareness, curiosity) as well as agency, co-agency and transformative competencies such as taking responsibility or reconciling tensions (OECD, 2020[16]). Individuals' ability to adapt and thrive in a fast-evolving world rests on education systems enabling them to acquire strong foundational knowledge and skills and providing opportunities for lifelong learning. This is supported by high-quality ECEC that enables all young children to develop the skills and learning habits that help them thrive throughout their lives. Skills identified as particularly important to benefit from lifelong learning include "learning to learn" or "self-directed learning" (OECD, 2021[17]). Another key component of the skills bundle required to meaningfully participate in the digital age, and increasingly recognised in future-oriented curriculum frameworks, is digital literacy, understood as a combination of the knowledge, skills and attitudes that enable a confident, critical and responsible engagement with digital technologies (Nascimbeni and Vosloo, 2019[18]). "Early digital literacy" refers to adapting this concept to early childhood (see Chapter 4).

Besides changes to high-level curriculum and learning goals, education systems are also exploring effective ways to integrate digital technology at all levels, building on the potential of applying digital technologies to teaching and learning processes (National Academies of Science Engineering and Medicine, 2018[19]; Escueta et al., 2020[20]). Digital tools are becoming increasingly present in educational settings, particularly in schools and universities, and growing demands are being placed on teachers to integrate these tools into their practice.

Results from the Programme for International Student Assessment (PISA) show that, in 2018, 15-year-old students spent around 8 hours per week on the Internet at school, on average, across OECD countries, while in countries such as Australia, Denmark, New Zealand, Sweden or the United States, students reported using the Internet at school for 12 hours or more per week. Moreover, on average across OECD countries, between 2012 and 2018, the amount of time 15-year-old students spent using the Internet at school increased from 13% to 23% of their total online time (OECD, 2021[21]). This suggests that while the bulk of 15-year-olds' online time happens outside of school, an increasing amount of their school activities make use of digital technologies. For instance, on average across OECD countries, 75% of students reported browsing the Internet for schoolwork at least once a month, including 28% who reported doing so almost every day or every day, and close to 50% reported using school computers for group work and communication with other students, or using learning apps or websites at least once a month, including in both cases around 15% of students engaging in these activities daily or nearly (Figure 2.2).

Adopting school-level practices for using digital devices is also becoming widespread in many OECD countries. For instance, a specific programme to prepare students for responsible Internet behaviour is reported by more than nine in ten school principals in Norway and the United Kingdom (compared to the OECD average of 60%), and regular discussions with teaching staff about the use of digital devices for

pedagogical purposes are reported by principals in more than eight in ten schools in Denmark, Latvia, Lithuania, New Zealand and Sweden (compared to the OECD average of 63%) (OECD, 2021[21]).

Figure 2.2. Frequency of activities on digital devices in secondary schools

Percentage of 15-year-old students reporting using digital devices for the following activities at school at least once a month, OECD average, 2018
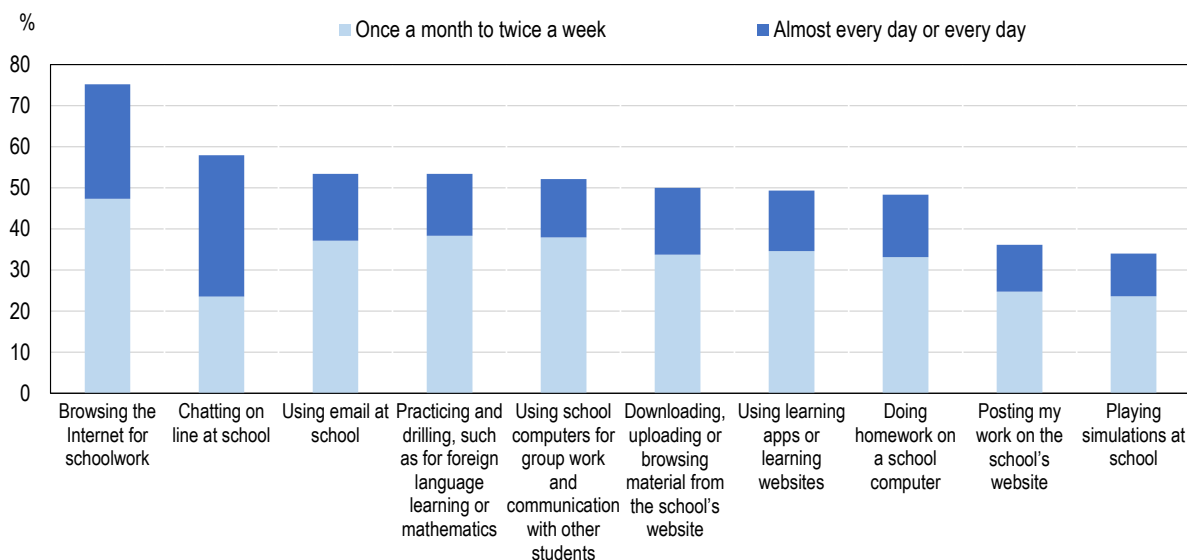
Notes: Based on student self-reports.
Items are ranked in descending order of the percentage of students who reported using digital devices for each activity at least once a month.
Source: OECD (2019[22]), *PISA 2018 Database*, Table B.6.14, https://www.oecd.org/pisa/data (accessed on 10 December 2022).

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These results, from data collected in 2018, are likely to underestimate current levels of integration of digital tools in school education given the acceleration and intensification of the use of digital technologies in the delivery of education spurred by the COVID-19 pandemic (OECD, 2021[23]), which was also experienced in early levels of education (OECD, 2021[24]). Going forward, more advanced technologies and more intensive use of data will likely be introduced in a growing number of teaching and learning processes and the management of educational organisations. While currently far from being mainstreamed, technologies such as intelligent tutoring systems, learning analytics, social robots or game-based standardised assessments may, in the years to come, become a regular feature of the schooling experiences of today's young children (OECD, 2021[25]).

### *Young children and digital technology in home environments*

This section reviews some key patterns regarding the use of digital technologies by and with young children in their home environments. An effort is made to highlight features and implications of specific relevance to children aged 0-6, as different from the dominant focus of research on older children and adolescents (Hooft Graafland, 2018[26]). Overall, the evidence clearly suggests that, across OECD countries, young children are using digital technologies in home environments with increasing frequency and intensity, for many different activities, and often with or under the supervision of their parents. The evidence contradicts simplistic framings of their relationships with digital technology, such as the discourse of the "digital native". This has a limited empirical basis and fails to account for the diverse experiences of young children with

digital media, the need to educate and support them to engage with technology in safe and meaningful ways, and the social inequalities that undermine many children's capacity to benefit from technology (OECD/Rebecca Eynon, 2020[27]; Hietajärvi, 2021[28]).

Evidence across OECD countries suggests that children's exposure to digital technology often starts before age 3, and that by ages 3 and 4, significant proportions of children are using digital devices and going online daily. Data from PISA indicate that, on average across OECD countries, around 4 in 10 15-year-olds in 2018 had used a digital device for the first time when they were age 6 or younger, and that close to three-quarters of them had interacted with digital devices by age 9 (Figure 2.3). These results suggest that, in the mid-2000s, the modal age for first using digital devices was 7-9 years old in most OECD countries.

Figure 2.3. Age of first use of digital devices in the mid-2000s

Percentage of 15-year-old students reporting the age when they first used a digital device, 2018
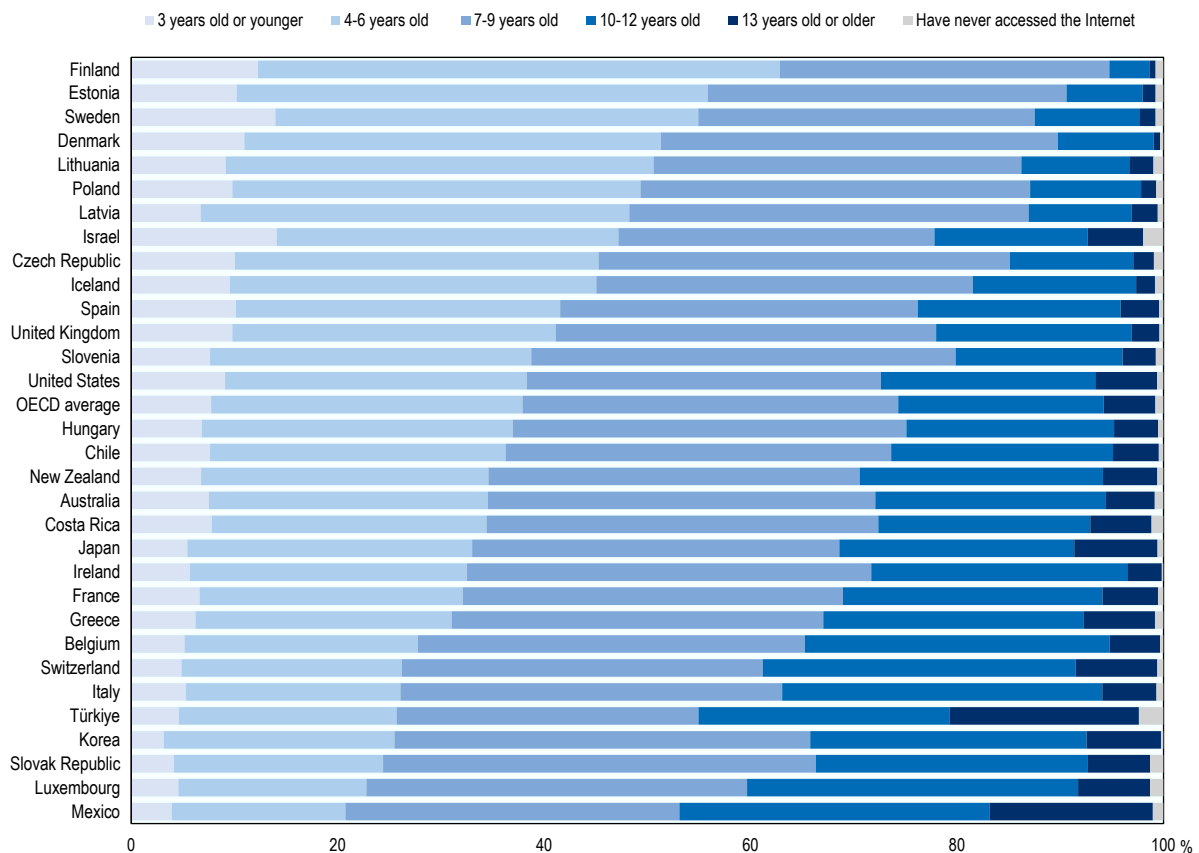
Notes: Based on student self-reports.
Countries are ranked in descending order of the percentage of students who reported that they first used a digital device at age 6 or younger.
Source: OECD (2019[22]), *PISA 2018 Database,* https://www.oecd.org/pisa/data (accessed on 10 December 2022).

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However, more recent evidence from the International Early Learning Study reveals that, in 2018, on average across the three participating countries (England, Estonia and the United States), 83% of the 5-year-olds sampled for the study were using a digital device at least once a week, with 42% of them using such a device every day, and only 7% of them having never or hardly ever used a device (OECD, 2020[29]).

Other parental surveys provide further indication that, over the last decade, the initiation to the use of digital devices and online activities has been occurring before age 6 for large shares of children. For instance, in Australia, 81% of parents with pre-schoolers reported in 2018 that their children were using the Internet, and the vast majority already by age 4 (eSafety Commissioner, 2018[30]). In France, a 2013 survey of parents of infants aged 5-40 months found that around 90% of children had been in contact with touch screens by age 2, and that around 50% of them were using this technology daily or several times a week (Cristia and Seidl, 2015[31]). Evidence from Japan indicates that around 70% of children attending kindergarten (0-6 years old) were using the Internet in 2021, a 15-percentage point increase from 2019 (Cabinet Office, Government of Japan, 2022[32]). In the United States, 81% of parents of children aged 3-4 and 57% of parents of children aged 0-2 surveyed in 2020 said their child watches videos online, with half of the children aged 4 or younger reported doing so daily (Pew Research Center, 2020[33]).

The time that young children spend interacting with digital technology is central to debates about the potential implications of these activities. A systematic review of the literature on the correlates of mobile screen media use among children under age 9 suggests that time on screen-based devices has increased in recent years and ranges between one and two hours a day for a large proportion of children, albeit much variation exists depending on their age and context (Paudel et al., 2017[34]). In Canada, 29% of children under age 5 were reported to spend one to two hours on a digital device on weekdays but more time on weekends (Brisson-Boivin, 2018[35]). In Korea, daily usage time of smartphones by children aged 2-5 was estimated at around 1 hour on weekdays and 1.5 hours on weekends in 2017, an increase of about 30% in media use time from 2015 (Lee et al., 2019[36]). A comparison of two recent cohorts in the United States found that the time children aged 2-5 spent engaged with technology increased by 32% between 1997 and 2014, when it accounted for close to 25 hours per week (Goode et al., 2019[37]). More recently, cross-country studies have documented increases in screen time during COVID-19 lockdowns both for toddlers (Bergmann et al., 2022[38]) and children aged 3-7 (Ribner et al., 2021[39]).

Young children use digital technology for multiple purposes, the most prevalent being for entertainment (Ofcom, 2022[40]; Cabinet Office, Government of Japan, 2022[32]). Watching cartoons and animations or listening to music on video-sharing platforms (e.g. YouTube) are the most common entertainment activities, along with creative and building games (e.g. Minecraft, Roblox) for gaming. Communication with family members is also important, generally in the company of parents and through shared rather than personal accounts or devices. Young children are much less likely than older children to be present on social media platforms, although a significant number have their own profiles, often in breach of age restrictions, or an indirect footprint when their parents post photos, videos or other information on these platforms ("sharenting") (Brisson-Boivin, 2018[35]; Ofcom, 2022[40]; Pew Research Center, 2020[33]). Young children's activities with digital technologies are varied, and often integrated with other, offline forms of entertainment, play and socialisation. These digital activities involve opportunities for creative self-expression, learning, play, and social and family bonding, but also a range of risks.

Young children tend to have very limited awareness of the risks they may encounter in digital environments. They often lack a clear understanding of the variety of content available online, of what constitutes problematic behaviour, of potential motivations for being contacted online and of the Internet as a commercial landscape, as well as of threats to privacy or of potential implications for their physical and emotional well-being (Chaudron, Di Gioia and Gemo, 2018[41]; Stoilova, Nandagiri and Livingstone, 2019[42]). They also have a limited capacity to prevent and react to those risks by themselves. The most salient concern for parents of young children is excessive screen time and its potential effects on sleep and cognitive capacities such as attention, but concerns about content and contact risks are also frequent (Brisson-Boivin, 2018[35]; Pew Research Center, 2020[33]). Parents of young children tend to perceive fewer benefits from their digital engagement than parents of older children, but the assessment is generally positive with regards to play and communication activities, and most negative with regards to participation in social media (Ofcom, 2022[40]).

Parents mediate children's engagement with digital technologies with a range of control, monitoring and support practices, which can be classified on a continuum from restrictive to enabling mediation. The prevalence of different mediation strategies varies depending on the level of education, socio-economic status and digital literacy of the parents themselves: enabling mediation is positively associated with more highly educated and digitally literate parents from advantaged socio-economic backgrounds (Livingstone et al., 2017[43]). Having some rules and supervision from parents about their online activity is the norm for most children aged 6 and under. Common parental rules include limits on screen time and types of oversight, such as asking what the child has been doing online, followed by direct supervision of their devices. Further, joint use of technology with adults, such as co-viewing audio-visual content and co-play, is common for young children. Co-viewing appears as a particularly relevant practice for scaffolding and helping children understand digital content (Gottschalk, 2019[44]).

Parents turn to many sources when seeking advice on how to handle and safeguard their young children's interactions with digital technologies. These include, primarily, other parents and online resources, but much less often schools or ECEC settings (eSafety Commissioner, 2018[30]; Cabinet Office, Government of Japan, 2022[32]; Ofcom, 2022[40]). The range of digital practices in home environments can expand when a meaningful integration of digital technologies in schoolwork leads to enlarging and diversifying the digital activities and tools that young children and parents are aware of. Such integration may take place through homework, which applies less often to the routines of young children, but also through the discovery of educational apps and resources and the modelling of practices with technology (Chaudron, Di Gioia and Gemo, 2018[41]). Further, children place more trust in the content they access on apps and sites used for school and homework than in the content of social media or news platforms (Ofcom, 2022[40]).

Digital divides among young children

Social inequalities are associated with digital divides, understood as disparities in opportunities to benefit from digital technologies as well as in resources to prevent and manage digital risks. Perspectives on such disparities have shifted from an early focus on access towards skills and usage and, more recently, to offline outcomes. Research emphasises that these dimensions are interrelated and can be addressed simultaneously (van Deursen and van Dijk, 2015[45]; Helsper and Smirnova, 2019[46]).

A first-level digital divide exists with regard to access to digital tools and connectivity. Results from PISA 2018 show that, by the mid-2000s, first experiences using digital devices and connecting to the Internet for children aged 6 and under were less common for children from families in the bottom quarter of the socio-economic distribution than for peers in the most advantaged families in about two-thirds of OECD countries (see Chapter 7). Access to digital technology is now almost universal for children in many OECD countries, although access to high-quality devices and broadband, and to enough devices in the household, is still a challenge for many disadvantaged children (Clarke and Thévenon, 2022[47]).

A second divide relates to inequalities in digital skills. This is a growing concern since early digital attitudes and practices can be an important determinant of technology uses and exposure to digital risks later in life. For instance, the International Computer and Information Literacy Study 2018 found that, across 12 countries, socio-economic status was a consistent positive predictor of 8th grade students' digital competences, including both their computer and information literacy and their computational thinking skills. The study also found that students from non-immigrant families scored higher on both types of competences than students from immigrant families (Fraillon et al., 2020[48]). In the same vein, PISA 2018 results indicate that opportunities to learn digital skills at school vary systematically by socio-economic background, and that students from more advantaged backgrounds had a stronger knowledge of reading strategies for assessing the credibility of digital sources than students from disadvantaged backgrounds in all participating countries and economies (Suarez-Alvarez, 2021[49]). These findings reflect differences in the extent to which children are able to use digital technology safely and productively in a variety of contexts.

Home environments remain the main sphere of influence for developing digital literacy, and much variation exists in families' capacity to promote young children's digital competences. Parents with low levels of digital literacy, often from low socio-economic backgrounds, tend to lack the necessary skills to extend their parenting efforts successfully into the digital world, whereas more digitally knowledgeable parents, generally from higher socio-economic status, are better able to help their children build their own digital skills. Parents with less confidence in their ability to manage digital risks and who hold more negative perceptions about digital technologies are more prone to adopt restrictive measures as a way to minimise potential harms, but may also be very permissive when having very low digital skills and risk awareness. As a result, their interactions with children tend to be characterised by low levels of active mediation. By contrast, digitally skilled parents tend to embrace more diversified perceptions and attitudes towards digital media, and to adopt a more enabling approach characterised by more co-use, monitoring and scaffolding, thus encouraging their children to explore and learn while also explaining why certain practices can be risky or inappropriate (Paus-Hasebrink et al., 2013[50]; Brito et al., 2017[51]; Livingstone et al., 2017[43]; Chaudron, Di Gioia and Gemo, 2018[41]). Parents' own digital literacy therefore conditions the opportunities and risks their children experience with digital tools.

Social gaps in digital literacy are therefore likely to persist if the responsibility for building digital skills lies solely with families. Education systems have an important compensatory role to play in levelling the playing field, and many policy initiatives to tackle the first- and second-level digital divides among children have been introduced in OECD countries in recent years (Burns and Gottschalk, 2019[4]). However, most of these target primary and secondary schools, as well as higher education. This report explores how these policies can be designed and implemented for ECEC.

Digital risks for young children

Increasing engagement with digital technologies has attracted a great deal of attention to their impact on children's development and well-being. Much of this is driven by the concern that time spent on digital devices may displace important analogue developmental activities, including physical exercise, sleep, play, reading or in-person interactions (Neuman, 1988[52]).

The OECD Typology of Risks (see Chapter 3) recognises health and well-being risks as a cross-cutting category of risks that children face in digital environments while also noting the limited availability of evidence to support many of the concerns voiced in public discourse (OECD, 2021[53]). The impact of technology use on children's physical, cognitive and socio-emotional development is indeed the focus of a burgeoning yet recent field of research, in which important knowledge gaps persist. Research tends to find small associations between technology use and both developmental (e.g. cognitive abilities, executive functions) and health and well-being outcomes (e.g. obesity, sleep, stress), and is largely inconclusive about the causal effect of technology and the real-life implications for children, due mainly to the correlational nature and limited quality of study designs (Gottschalk, 2019[44]; Kardefelt-Winther, 2019[54]; Bediou, Rich and Bavelier, 2020[55]). Nonetheless, some consistent findings emerge from the literature (for a review, see Gottschalk (2019[44])). These include, among others, the disruptive effects of blue light on melatonin production and sleep (e.g. Figueiro and Overington (2016[56])); the fact that both no and heavy digital screen time can have small negative impacts on socio-emotional well-being, compared to small positive effects for moderate use of technology (e.g. Przybylski and Weinstein (2017[57])); and substantial variation in impact depending on the type of digital activity (active vs. passive engagement), on the type of content (age-appropriateness; entertainment vs. educational focus), and on the degree and style of adult mediation (e.g. Flecha et al. (2020[58])). An important caveat is the paucity of research on children aged 6 and under, which raises questions on the generalisability of findings largely based on the technology usage patterns and well-being outcomes of children in late childhood and adolescence.

Excess exposure to screens has come to epitomise threats to young children's development and well-being and spurred much discussion among parents, educators and health specialists. Screen time, measured as the duration of intentional exposure to screen-based media, is the object of many guidelines and recommendations issued by professional medical associations and governments in OECD countries, often with a quantitative and limitation-focused approach but also, in some cases, with a growing emphasis on the co-use of developmentally appropriate media between parents and children (for a review, see Burns and Gottschalk (2019[4])). Nonetheless, screen time is increasingly seen as a simplistic construct that fails to capture the heterogeneity of the content, contexts and interactivity of screen-based experiences, and thus growingly contested as a basis for advancing research and providing advice for policy and practice (Bediou, Rich and Bavelier, 2020[55]; Hietajärvi, 2021[59]). Many of the current shortcomings of the screen time literature are rooted in measurement and conceptual difficulties, including reporting biases and varying modalities of engagement with digital media (Kaye et al., 2020[60]). Going forward, new assessments of media usage that improve on conventional measures and conceptualisations of technology use can be especially relevant for research on young children, given the importance of contextual factors such as the parental mediation of media use (Barr et al., 2020[61]; Radesky et al., 2020[62]). Presently, though, the lack of clear and consistent evidence-based recommendations on young children's screen time and the use of digital technology creates dilemmas for policy and practice (Straker et al., 2018[63]).

The tensions in reconciling opportunities to prepare children for a technology-rich world and protect them against potential harms are particularly acute in the case of children under age 3, as infants and toddlers have highly specific developmental needs. The first three years of a child's life are characterised by rapid brain development, reliance on relationships with adults and extreme responsiveness to environmental variation (National Scientific Council on the Developing Child, 2004[64]). Children under age 3 learn aptly from real-life interactions with other people and objects but struggle to transfer knowledge from digital media (Moser et al., 2015[65]). Research finds that early screen exposure can have a negative effect on the development of cognitive abilities, but this appears largely mediated by contextual factors such as whether viewing is supervised or the age-appropriateness of the content (Guellai et al., 2022[66]). Screen time guidelines often provide specific recommendations for children under age 3, including strong limitations from birth through 18 months, but the stance of some organisations is, however, evolving. For instance, the updated guidelines from the American Academy of Pediatrics recommend limiting screen use to one hour a day for toddlers, but emphasise the co-use of developmentally appropriate media, also for infants and toddlers (APP, 2016[67]). In the United Kingdom, a guide published by the Royal College of Paediatrics and Child Health in 2019 avoids recommending age-based limits for screen use, underlining instead that families determine screen time in relation to whether it may displace health-related behaviours or social activities (RCPCH, 2019[68]).

With these caveats in mind, the literature offers some insights into the impact digital technology use can have on young children specifically. A recent meta-analysis shows that sleep is the outcome for which findings are more consistent (Mallawaarachchi et al., 2022[69]). Evidence suggests that the negative association of screen time with sleep consistency and sleep duration is particularly pronounced for children under age 6, albeit effect sizes remain modest: for instance, one study estimated that each hour of digital screen time would be associated with eight fewer minutes of sleep per night for this age group, and that time spent with digital devices accounts for less than 2% of the variability in sleep duration (Przybylski, 2019[70]). Besides screen time, the literature points to the importance of the timing of device use, and specifically to avoid screens as part of bedtime routines. By contrast, research is less conclusive regarding the impact of digital technology use on other health and well-being outcomes, although some studies find modest negative associations between the amount of time that young children spend with digital devices and their self-regulation and externalising behaviours (Mallawaarachchi et al., 2022[69]). Research on children under age 3 provides a further indication that the conditions for healthy technology use involve not only time limits, but also media experiences that respond to children's individual characteristics, include content that engages children in meaningful and active ways, and allow interactions with responsive adults

(Barr, McClure and Parlakian, 2018[71]). Overall, the evidence suggests that it is the quality rather than the quantity of digital media use that has the strongest influence on children's developmental and well-being outcomes.

Privacy is another category of risk with the potential to have wide-ranging implications on children's lives (OECD, 2021[53]). Risks to children's privacy are at the forefront of current concerns regarding children's activities in the digital environment (Council of Europe, 2021[72]). Such activities are the focus of commercial interests and can result in multiple types of data collection and processing. Research indicates that children tend to be aware of data supplied knowingly ("given data") in interpersonal contexts, for instance because they provide the data themselves or are aware that their family and friends do so. However, their understanding of how they may be contributing to the generation of other types of data (e.g. "data traces" left by online activity, or "inferred" data derived from other data) and of the value that such data can have for other parties is often limited and depends on contextual opportunities to learn about privacy issues. The small number of studies that include children under age 8 further suggests that young children have low awareness of the risks of sharing information online (Stoilova, Nandagiri and Livingstone, 2019[42]). Research documents also multiple threats to privacy in apps and services targeted at young children, including the collection and sharing of personal identifiers or advertising (Jibb et al., 2022[73]). Parenting practices using digital technologies, from the use of tracking devices to sharing information on children through social media, also play a role in the increasing datafication of childhood and associated privacy risks (Siibak, 2019[74]). Therefore, protecting young children's data and privacy online requires concerted efforts, from advice and rule setting by responsible adults to implementing safety measures in technology design and digital service provision (see Chapter 3). Additionally, with a growing reliance on digital technology for delivering education, accelerated by the COVID-19 pandemic, concerns regarding the security of the data managed by education authorities and providers are also mounting (OECD, 2022[75]).

Policy challenges regarding digitalisation and young children

The challenges brought about by digitalisation are multifaceted and bear on various interconnected policy areas. This section draws on responses to the *ECEC in the Digital World* policy survey (2022) to describe the main policy challenges identified by participating countries and jurisdictions in relation to digitalisation and young children generally. It looks at the prominence of different challenges as well as at the extent to which specific challenges combine into clusters. This analysis contributes to identifying the priorities and motivations of governments and ECEC systems in responding to digitalisation as of 2022, when the data were collected.

Responses to the survey indicate that risk-focused challenges dominate policy agendas for responding to the impact of digitalisation on young children (Figure 2.4). The challenges that countries and jurisdictions most commonly listed as being of "very high" or "high" importance in their national or regional contexts relate to protecting young children's privacy and preventing both physical and socio-emotional harms. This suggests that major concerns exist regarding the potential negative consequences of the use of digital tools by young children, likely related to the difficulty of controlling the collection and uses of their personal data, as well as to the view that heavy engagement with screens and digital activities may have harmful effects on children's well-being. Many countries and jurisdictions rated at least two of these challenges as being of "very high importance": for instance, Australia, the Czech Republic, the Slovak Republic and the United Arab Emirates (Dubai) did so regarding the prevention of both physical and socio-emotional harms; Hungary and Spain included privacy protection in that category as well.

Inequalities in access to digital technology and in the development of digital literacy are two other challenges listed as being of "very high" or "high" importance by many countries and jurisdictions. Digitalisation is thus broadly perceived as a trend that can exacerbate inequalities among young children unless policy compensates for the unequal capacity of families and individuals to engage in safe and meaningful uses of digital tools. Generally, survey respondents rated the two types of digital divides with

the same level of importance. For instance, Germany rated both challenges as having "very high" importance, and 14 countries and jurisdictions rated both as having "high" importance.

Figure 2.4. Policy challenges regarding digitalisation and young children

Number of countries and jurisdictions identifying different policy challenges, 2022
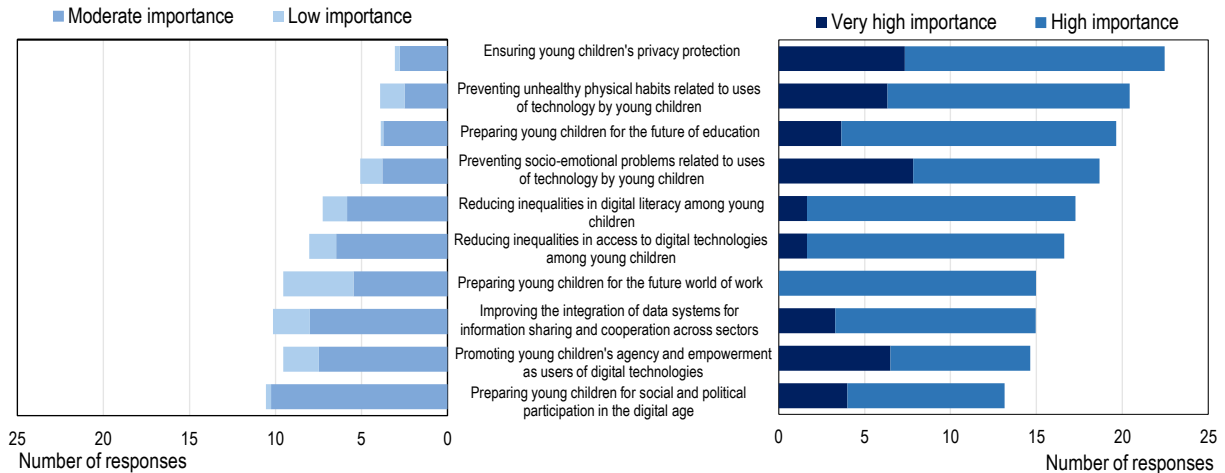
Notes: Responses are weighted so that the overall weight of reported responses for each country equals one. See Annex A.
The response category "very high importance" was limited to three out of ten response items maximum.
Items are sorted in descending order of the share of countries selecting the response categories "very high importance" or "high importance".
Source: OECD (2022[76]), *ECEC in a Digital World* policy survey, Table B.1.

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Countries and jurisdictions are also aware that important policy challenges relate to their ability to seize opportunities from digitalisation. Responses to the survey indicate that early childhood is seen as an important period to prepare for the changes that education is undergoing. Opportunities to prepare young children for the future world of work and for citizenship in the digital age were also mentioned as important challenges by many countries, but relatively less than other options. In particular, preparing for work is the only challenge that no country or jurisdiction listed as being of "very high" importance and the most often ranked as being of "low" importance. This prioritisation of challenges reflects the view that the key goals for young children relate to setting foundations for later experiences in the education system and society more generally, rather than to preparedness for the labour market. Further, promoting young children's agency and empowerment with digital technologies, which can be seen as a transversal enabler for opportunities in other areas, is a challenge listed as being of "very high" importance by many respondents. Notably, Finland, Japan, Norway and Sweden listed two opportunity-focused challenges among their top three priorities.

A more specific opportunity identified as important by several respondents is the use of digital tools to better integrate data across the different services that support young children and families, which holds the potential to improve the co-ordination of policy action across multiple sectors. This challenge was noted as having "very high" importance by Japan; the Slovak Republic; South Africa; and the Canadian provinces of Manitoba (kindergarten sector only) and Quebec.
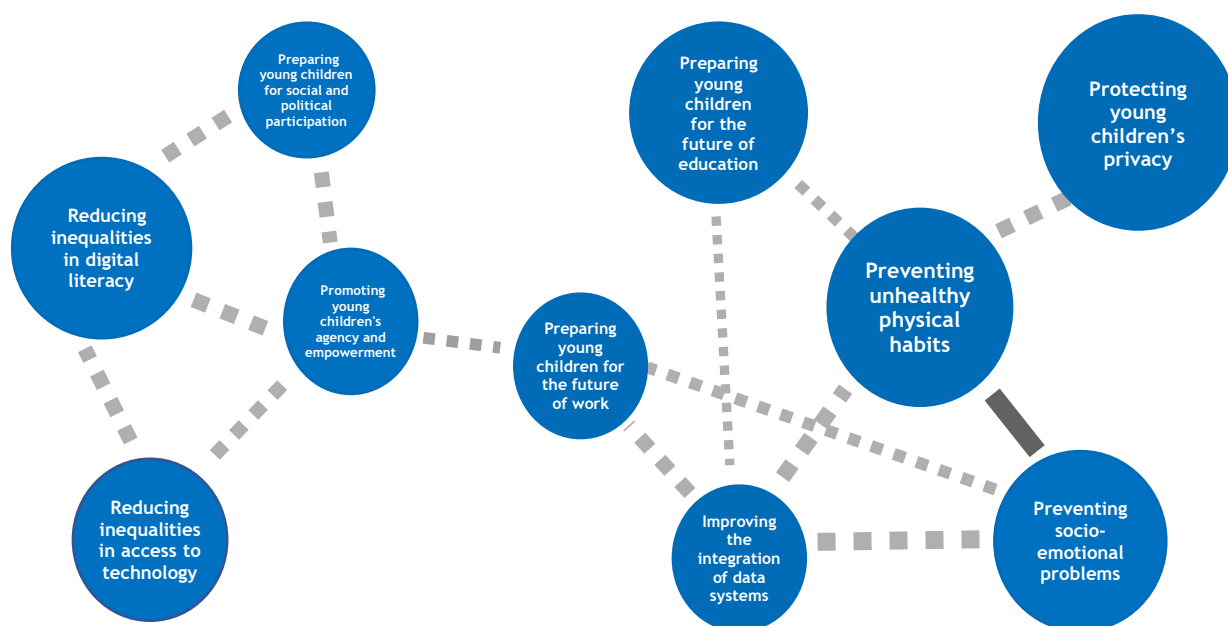
Further insights about these policy challenges can be derived from the associations between their ratings of importance as attributed by countries and jurisdictions. Two clusters of challenges emerge from this analysis (Figure 2.5). The first cluster, on the right-hand side of the figure, includes protecting children's privacy and preventing harms to their physical and socio-emotional well-being, with strong correlations

reflecting the interconnected nature of digital risks (OECD, 2021[53]). Within the same group, the positive association with the level of importance assigned to integrating data systems across services supporting young children and families suggests an opportunity to address these risks.

The second cluster, on the left-hand side of the figure, groups risk-focused challenges about digital divides and opportunity-focused challenges about children's empowerment as users of digital technology and as citizens in the digital age. This may reflect the view that levelling inequalities in access to technology and digital literacy represents a pre-condition for seizing these opportunities. Interestingly, correlations between challenges across the two clusters are weak, suggesting that concerns about digital divides are seen as having a stronger bearing on uneven opportunities to benefit from digitalisation than on differential exposure to digital risks.

Figure 2.5. Clustering of policy challenges regarding digitalisation and young children

Correlations between average ratings of importance across all countries and jurisdictions, 2022

Notes: The size of circles reflects the number of times a challenge was selected as being of "very high" or "high" importance; larger circles denote greater importance. The width of the connectors reflects the correlations between the ratings of importance attributed to each pair of challenges across countries and jurisdictions; wider connectors denote stronger correlations (only correlations >.33 with partial (adjusted) correlation >.20 are shown).
Source: OECD (2022[76]), *ECEC in a Digital World* policy survey, Table B.1.

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Making early childhood education and care responsive to digitalisation

Children's experiences in their early years, including those in ECEC, are critical for building strong and equitable foundations for individual and societal outcomes. However, at a time when digital technologies transform the ways in which billions participate in the economy, society and cultural life, ECEC continues to operate with large uncertainties about the best policies for exploiting the opportunities and managing the risks brought about by digitalisation. Designing policies that empower and protect children in digital environments is an important element to putting people first in the digital transformation.

There is growing recognition of the potential of high-quality ECEC to give a strong start to all young children by providing equitable opportunities and experiences that support their learning, development and well-being. Quality in ECEC is a multidimensional concept, but at its core is "process quality": the range of interactions that children experience through ECEC settings with other children, with staff and teachers, with space and materials, and with their families and the wider community (OECD, 2018[77]; 2021[78]).

Identifying and implementing opportunities for using digital technologies in support of process quality emerges as a priority to make ECEC systems responsive to digitalisation and improve their capacity to prepare children for an increasingly technology-rich world. However, technology cannot replace the real-life interactions with ECEC teachers and carers that young children need for their learning and well-being. Beyond the possibilities for digital technologies to support process quality, their potential to enhance work processes (e.g. professional learning, data development) can enhance ECEC quality more broadly. This report discusses how digital technologies can enhance, rather than interfere with, the processes that are important for supporting young children's development and the work of ECEC professionals.

A pressing but disputed priority

Reflecting on open debates about the role digital technologies should play in young children's learning and development, it is only recently that responses to digitalisation have attracted research and policy attention in ECEC. Across different Starting Strong policy reviews, digital skills were included as a content area in less than 10% of the ECEC curriculum frameworks covered in 2011 (OECD, 2011[79]), 42% of the frameworks covered in 2015 (OECD, 2017[80]) and 61% of the frameworks (for all ages) covered in 2019 (OECD, 2021[78]). Despite this increasing recognition over time, digital skills remained the second-least common area of ECEC learning frameworks among the 16 areas considered in 2019.

Comparative indicators about digitalisation in early levels of education are scarce, but TALIS Starting Strong and TALIS at the ISCED 1 level offer a glimpse into aspects such as the attitudes of ECEC professionals and primary education teachers or the extent to which digital technologies are part of their training opportunities and regular practice. At the ECEC level, digital skills rank low among the abilities and skills that ECEC professionals see as important for children to develop for their life in the future as part of their experience in ECEC (OECD, 2019[81]). Similarly, the use of digital technology to support young children's learning is the area where ECEC staff report the lowest levels of self-efficacy among different aspects of their work with children (OECD, 2020[82]). Both the percentage of ECEC teachers who think that digital skills are of "high importance" in preparing children for the future and teachers' levels of self-efficacy for using technology vary widely across countries (Figure 2.6). Nonetheless, in countries where more teachers perceive digital skills as being highly important for children, their confidence in using technology for pedagogical purposes tends also to be higher, and vice versa. Although the data cannot support any causal claims or directionality in this association, the results may suggest that the inclusion of digital skills and digital technologies in the ECEC curriculum and workforce preparation programmes can influence the attitudes of ECEC professionals. Research finds that pro-technology attitudes in the cultural sphere and national ECEC policies are macro-level factors shaping these professional attitudes (Mertala, 2019[83]), which in turn are important for a successful integration of technology in staff practices (Blackwell, Lauricella and Wartella, 2014[84]).

More expectations exist for incorporating digital technologies into teaching and learning practices at the primary level of education. TALIS data show, for instance, that the use of information and communications technology (ICT) for teaching was a content area included in the initial education or training programmes of more than two-thirds of the primary teachers surveyed in 2018 in countries like England (United Kingdom), Japan, Korea or the Republic of Türkiye; for about half of the primary teachers in the Flemish Community of Belgium, France or Spain; or for about four in ten teachers in Denmark and Sweden (OECD, 2019[85]). Moreover, in all these systems, a significantly larger share of novice (i.e. with five or fewer years of experience) than of more experienced primary education teachers reported that this content

area was part of their initial preparation or training (OECD, 2021[86]), which reflects an increasing recognition of digitalisation in workforce preparation programmes at the primary level of education across countries.

Figure 2.6. Perceived importance of digital skills for children and sense of self-efficacy for using technology among early childhood education and care teachers

Percentage of ECEC teachers who believe that ICT skills are of "high importance" in preparing children for the future, and who report that they feel they can use digital technology to support children's learning in their work, 2018
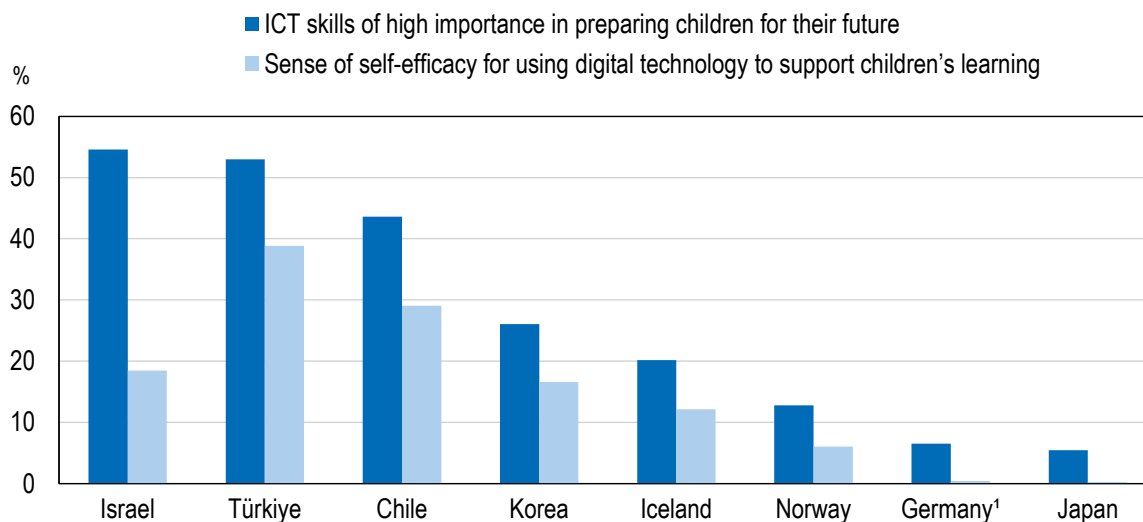
Notes: 1. Estimates for sub-groups and estimated differences between sub-groups need to be interpreted with care.
Results refer to ECEC staff in teaching roles ("teachers"), except for Iceland where they refer to all staff. ECEC teachers are those with the most responsibility for a group of children.
Countries are sorted in descending order of the percentage of teachers perceiving ICT skills as being of "high importance" in preparing children for their future.
Source: OECD (2019[87]), *TALIS Starting Strong 2018 Database*, https://www.oecd.org/education/school/oecdtalisstartingstrongdata.htm (accessed on 10 December 2022).

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The COVID-19 pandemic push

Education systems were deeply affected by the COVID-19 pandemic. The transformations that digitalisation is bringing to the world of education were accelerated during the pandemic, and the systems that were less prepared for the digital transition fell significantly behind. This shows that inequalities in digital infrastructure and digital competences can hinder the inclusivity of education systems (Schleicher, 2022[88]).

Approaches to the continuity of ECEC during the COVID-19 pandemic varied notably across countries and jurisdictions. The crisis highlighted the role of ECEC staff in supporting children as well as the importance of ECEC services for parental employment, but also underscored long-term challenges such as workforce shortages and limited support to staff for implementing curriculum frameworks (OECD, 2021[78]). Nonetheless, the ECEC sector responded to steep demands to ensure continuity of service during school and centre closures and put into practice many innovative strategies to support children and families, many of which involved using digital technologies. In 2020, countries reacted as fast as they could, but the

pandemic brought to the forefront the need to engage in a deeper exploration of the benefits and risks associated with the use of digital technologies in the education of young children to inform future policy developments.

Drawing on a policy survey completed by 34 countries and jurisdictions, a G20/OECD study investigated how digital technologies were used to maintain education continuity for young children in 2020, the challenges that arose and the changes that the pandemic may bring to ECEC policies around digitalisation in the near future (OECD, 2021[24]). Some major findings of this study include:

- Prior to the pandemic, in ECEC, digital technologies were more extensively used as communication tools than as pedagogical tools for activities with children.

- Most participating countries expected pre-primary teachers to use digital technologies in their work with children only to a "moderate" or "small" extent. Similarly, most countries reported that children had just "moderate" or "small" levels of exposure to digital technologies in their pre-primary centres prior to 2020.

- In the majority of participating countries, schools/centres and/or other actors at the local level held the main responsibilities regarding the choice of technology tools and the approaches for their integration activities with young children, generally within frameworks established by governments.

- The pandemic accelerated the adoption of measures to protect young children from potential harms from digital technology. These measures included recommendations for teachers and parents about young children's screen time, advice to families about adult-supervised use of technology, and information on approaches to protect children's privacy and well-being in digital environments.

- The main challenges encountered by countries and jurisdictions in using technology for maintaining continuity of ECEC in 2020 related to the capacity of families to support distance education activities, equipment and connectivity problems, and a shortage of digital tools and content specifically designed for young children. These affected mostly children from socio-economically disadvantaged backgrounds and children with special education needs.

- The pandemic acted as a catalyst for rethinking policies regarding the use of digital technologies in early education. A third of the countries and jurisdictions reported "substantial" changes in their approach to integrating digital tools into pre-primary education. The most commonly listed strategy as a high priority going forward was to improve professional training on digital competencies.

Policy challenges regarding digitalisation and early childhood education and care

The *ECEC in the Digital World* policy survey (2022) asked countries and jurisdictions to rate the relative importance of a series of policy challenges more specifically related to how ECEC can respond to digitalisation. This information sheds light on priorities for policy action in the ECEC sector.

Promoting safe and responsible uses of digital technologies by both ECEC staff and young children are the two challenges the most commonly rated as being of "very high" or "high" importance (Figure 2.7). This can be seen as mirroring the emphasis on risk-focused challenges for young children more generally. Interestingly, however, the challenge to which countries and jurisdictions attributed the lowest level of importance, by a large margin, is that of preserving ECEC as a digital-free space. Results thus suggest that countries' and jurisdictions' strategies for preventing potential harms hinge mainly on preparing ECEC staff and young children to engage in safe uses of digital technologies rather than on keeping these tools outside of ECEC settings. This may reflect the perception that digital technologies have become a fixture of contemporary childhood, and hence a commitment on the part of ECEC systems to mitigate adverse impacts by helping young children to live with and manage the associated risks without foregoing the opportunities. In the same vein, other policy challenges perceived to be of major importance are preparing the ECEC workforce to use digital technologies effectively in a variety of other work processes (e.g. professional learning and collaboration, administrative tasks), as well as helping children to engage

in active and creative uses of digital tools. Adapting ECEC learning and development frameworks to reflect the skills bundle demanded by the digital age was also listed as being of "very high" or "high" importance by a large number of countries and jurisdictions.

A different set of challenges with more varying ratings of importance pertain to improving digital infrastructure, better integrating data within the ECEC sector, and digitalising monitoring and assessment processes. These challenges may appear less pressing to countries and jurisdictions having already made progress in these areas, or because they hinge to a greater extent on infrastructure provision rather than on practical implementation (as compared, for instance, with the integration of digital tools in pedagogical work). As for the promotion of digital channels for communication and engagement with families, its intermediate rating suggests that fewer difficulties are perceived for integrating digital tools into these practices, especially after the experience of the COVID-19 pandemic.

Overall, the promotion of digital literacy, in its multiple dimensions and for both ECEC professionals and young children, underlies the challenges that most countries and jurisdictions considered the most important, which relate primarily to developing safe and meaningful uses of digital technologies in interactions with children. By contrast, digitalising other areas or work processes, including data management, monitoring and evaluation, and communication with families, is perceived as a relatively less difficult challenge.

Figure 2.7. Policy challenges regarding digitalisation and early childhood education and care

Number of countries and jurisdictions identifying different policy challenges, 2022
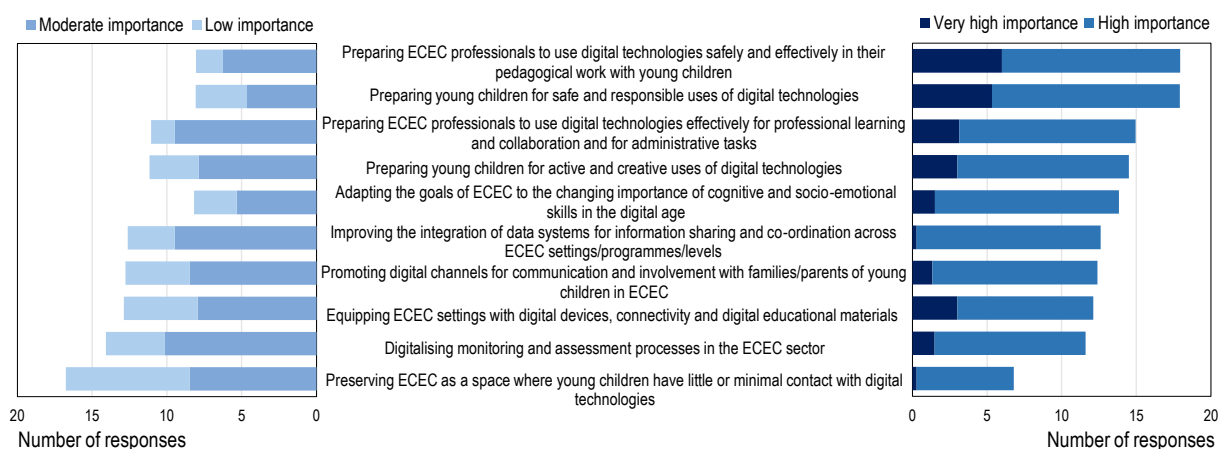
Notes: Responses are weighted so that the overall weight of reported responses for each country equals one. See Annex A.
The response category "very high importance" was limited to three out of ten response items maximum.
Items are sorted in descending order of the share of countries selecting response the categories "very high importance" or "high importance".
Source: OECD (2022[76]), *ECEC in a Digital World* policy survey, Table B.2.
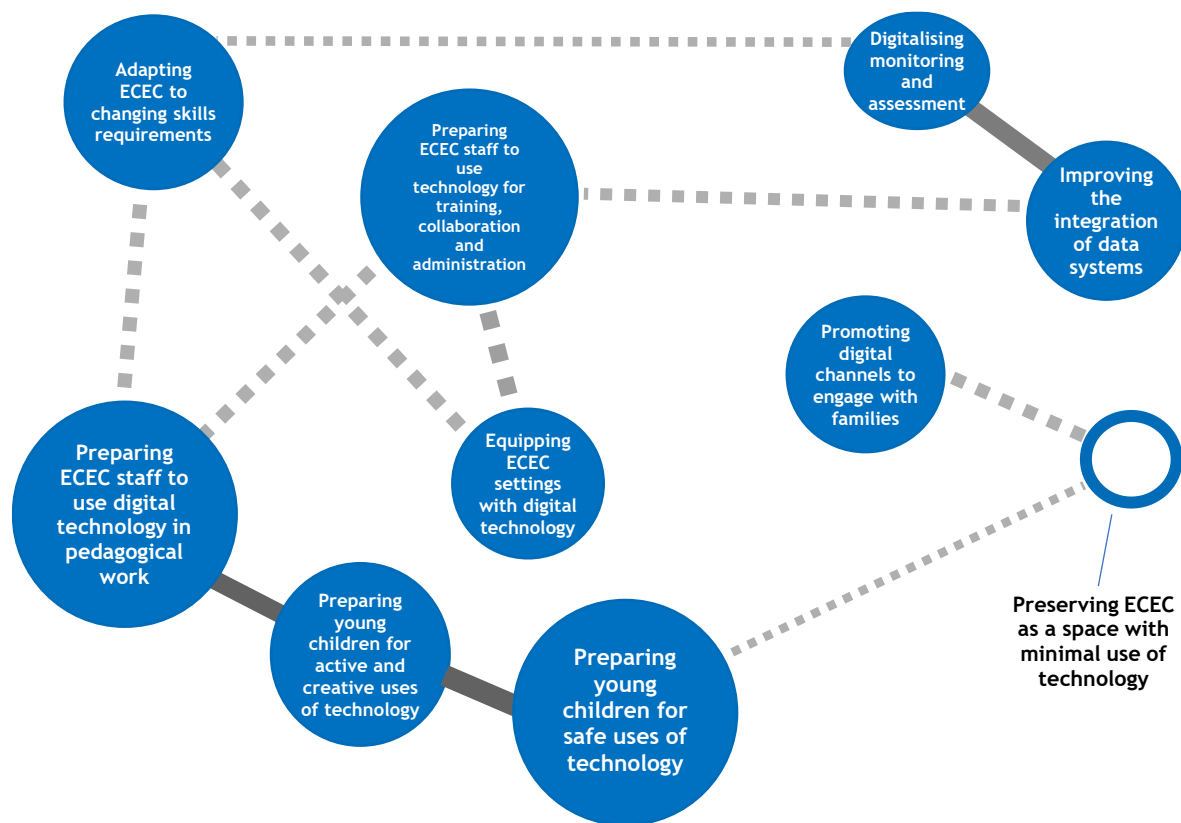
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The analysis of correlations between ratings of importance suggests that policy challenges regarding digitalisation and ECEC also form two broad clusters (Figure 2.8). The first group, on the left-hand side of the figure, corresponds to goals around integrating digital tools into many of the interaction processes that support process quality in ECEC settings. These include most notably pedagogical activities with children, but also other aspects of work such as professional learning and collaboration between ECEC staff. A shared feature of these challenges, which are strongly inter-correlated in countries' ratings, is their reliance on the development of digital literacy, for both ECEC professionals and young children, and concerning competencies for both managing risks and for going beyond operational and passive uses of digital tools.

The Czech Republic, Japan, Norway and the German state of Bavaria are among the countries and jurisdictions that attributed consistently high levels of importance to the challenges in this cluster.

The second cluster, on the right-hand side of the figure, is made up of challenges about processes that involve data use, such as monitoring and assessment or the integration of data systems, but also includes communication with families on digital channels. These goals emphasise using digital technologies in processes other than direct interactions with children. Unsurprisingly, when listed as important, the limitation of children's exposure to digital tools in ECEC settings clusters with these other goals. Some countries and jurisdictions having assigned high levels of importance to the challenges in this cluster include Australia, Spain, the United Arab Emirates (Dubai), and the Canadian provinces of Manitoba (kindergarten sector only) and New Brunswick.

Figure 2.8. Clustering of policy challenges regarding digitalisation and early childhood education and care

Correlations between average ratings of importance across all countries and jurisdictions, 2022

Notes: The size of circles reflects the number of times a challenge was selected as being of "very high" or "high" importance; larger circles denote greater importance. The width of the connectors reflects the correlations between the ratings of importance attributed to each pair of challenges across countries and jurisdictions; wider connectors denote stronger correlations (only correlations >.33 with partial (adjusted) correlation >.20 are shown).
Source: OECD (2022[76]), *ECEC in a Digital World* policy survey, Table B.2.

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Policy areas to support high-quality and equitable early childhood education and care in the digital age

This report builds on the analytical framework of the OECD Starting Strong policy reviews, which identifies five policy levers instrumental for building high-quality and equitable ECEC systems (OECD, 2011[79]; 2021[78]). These levers are: 1) quality standards, governance and funding; 2) curriculum and pedagogy; 3) workforce development; 4) monitoring and data; and 5) family and community engagement. In addition, the framework considers equity and inclusion as a transversal theme. These policy levers can be revisited in light of the digital transformation and the complex nature of quality in ECEC, which requires multifaceted policy solutions. The analytical focus on responses to digitalisation in each of these policy areas is described below, mirroring the structure of the report.

Standards for protecting children in digital environments

Governance, standards and funding are core components of structural quality, enabling conditions for process quality, and thus considered the foundation for all other policies to support child development, learning and well-being in ECEC settings. All these components vary greatly from one country to another and are rooted in their historical and cultural contexts. This report addresses strategies in this policy area through the lens of the adoption, in ECEC systems, of standards for protecting young children in digital environments. This approach is motivated by recent policy developments at the national and international levels, including the OECD Recommendation of the Council on Children in the Digital Environment adopted in 2021 (OECD, 2021[89]). The Recommendation aims to help governments implement coherent policies to address the new and evolving risks that children can encounter in digital environments while continuing to support children in realising the opportunities of digitalisation. Chapter 3 builds on the themes of the Recommendation by discussing standards for digital service providers as well as guidance for ECEC professionals, parents and families for safe uses of digital technology with young children. In doing so, it explores the role ECEC can play in preventing potential harms to children resulting from digital risks. Some of the considerations in this policy area relate to clarifying the responsibilities of ECEC staff in protecting children, providing evidence-based guidance and focused professional development opportunities, improving co-ordination among different sets of actors, and ensuring that risk-focused guidance is complemented by information about opportunities and educational purposes of technologies.

ECEC curriculum and pedagogy for a digital world

By defining broad learning and development goals as well as supporting content and types of activities, curriculum frameworks are crucial to make ECEC responsive to the changes in children's lives brought about by the digital transformation. This includes helping children develop a broad set of skills and identifying effective pedagogies for using digital technologies in interactions with young children. Approaches to making curriculum frameworks and pedagogical guidance responsive to the digital transformation are discussed in Chapter 4. Supporting a future-oriented or 21st century curriculum framework involves adapting curriculum frameworks to the changing nature of childhood, changing skills requirements of the digital age, as well as incorporating the objective of developing early digital literacy. Pedagogical approaches can also be adapted to exploit the affordances (e.g. interactivity, multimodality) of the different types of digital tools that can be used with children in ECEC settings. Considerations in this policy area include addressing the fragmentation of curriculum frameworks or their absence for the youngest children, providing support and training opportunities to prepare ECEC staff to implement curriculum innovations, or improving the monitoring of the activities in which technologies may be used with children in ECEC settings.

ECEC workforce development for the digital age

ECEC professionals are the major driver of the quality of an ECEC system. Workforce development encompasses initial education and training and continuous professional development, and the governance, duration, quality and content of these programmes have important implications for the staff's capacity to develop high-quality interactions with children and parents in ECEC settings (OECD, 2021[78]). Digitalisation places a set of new demands and opportunities on ECEC professionals, from promoting safe, developmentally appropriate and effective uses of digital technology with children to incorporating digital tools for improving a range of other work processes (e.g. professional development and collaboration, communicating with parents and families, or administrative tasks). Chapter 5 explores strategies for ECEC systems to provide the support that staff need to meet these demands, looking at digital competence frameworks and their integration in pre-service and in-service training. Specific considerations in this area include providing clear guidelines or standards on digital competencies in training programmes, differentiating requirements for staff with varying roles and responsibilities, providing ECEC staff and settings with sufficient resources and time to engage with digital tools, ensuring the quality of training, and exploiting opportunities for combining formal and informal professional learning about digital competences.

Family and community engagement in ECEC in a digital world

Engaging with parents is increasingly seen as an important policy lever to enhance ECEC's contribution to child development and learning. Parental engagement in ECEC is critical in improving staff's knowledge about the children they work with and for ensuring alignment with learning and development opportunities in home environments. Chapter 6 explores conditions and barriers for using digital technologies to strengthen family engagement in ECEC, including for facilitating a higher frequency and quality of interactions between ECEC staff and family members and reaching out to a greater diversity of groups of society. Some of the considerations in this area relate to researching and documenting ways in which digital channels enhance rather than replace meaningful communication and engagement with parents and to support their adoption across the sector, including by incorporating this dimension into workforce development programmes.

Equitable and inclusive digitalisation in ECEC

Equity and inclusion are a transversal theme across policy areas and a critical aspect complementing the quality of ECEC systems. Equity and inclusion goals relate to ensuring that children from all backgrounds have access to high-quality ECEC rather than to simply achieving low variability in quality. In the digital age, promoting equity and inclusion means that all children have similar opportunities to benefit from digitalisation and similar resources to prevent undesirable outcomes. Chapter 7 looks at digital divides among young children and ECEC centres, focusing specifically on children from socio-economically disadvantaged backgrounds, children with special education needs and children with a different first language. Drawing on several OECD databases in addition to the research literature, the chapter presents evidence on differences in access to and use of digital technologies in home environments as well as in ECEC settings, and discusses opportunities to harness digital technologies in pedagogical and other professional practices to make ECEC more equitable and inclusive. Important considerations in this policy area relate to reducing differences in the quality of digital infrastructure across ECEC centres, promoting safe and educational digital mediation strategies among parents with lower levels of digital skills, and promoting inclusive digital practices regarding pedagogy and engagement with families.

ECEC data and monitoring in the digital age

Data and monitoring can encourage quality in ECEC by establishing facts, trends and evidence about whether children have equitable access to high-quality ECEC. They can be used to enhance accountability and support improvements in policy design and implementation. Chapter 8 addresses strategies in this

policy area from the perspective of ECEC data systems and the adaptation of quality monitoring frameworks. Digital technologies enhance the capacity to efficiently store, link and use the wealth of data collected in the ECEC sector for a range of purposes. At the same time, digitalisation brings new demands for quality monitoring, as digital technologies are increasingly integrated into ECEC settings. Considerations for activating this policy lever include creating a strong data infrastructure for the ECEC sector and aligning quality monitoring with the changes in other policy areas.

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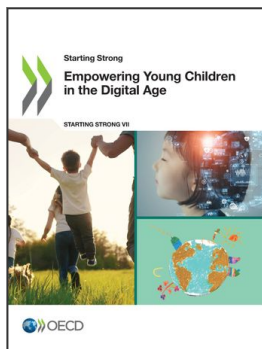
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Empowering Young Children in the Digital Age

Access the complete publication at:
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